Daystar Products International
841 S. 71st Ave.
Phoenix, AZ 85043
800-595-7659 toll-free
623-907-0081 local
623-907-0088 fax
www.daystarweb.com

Rear Block Kit Instructions

Thank You for Choosing Daystar
Daystar recommends a certified technician install this system . In addition to these instructions , professional knowledge of disassemble/reassembly procedures as well as post instruction checks must be known. Attempts to install this system without this knowledge and expertise may jeopardize the integrity and/or operating of the vehicle.

Please read all the instructions before beginning the installation. Be sure you have all the needed parts and understand where they go. If anything is missing, do not proceed with the installation, Call Daystar Products to obtain needed items.

Installation Procedure

1. Place the vehicle on a flat, level surface and set the parking brake. Raise the rear of vehicle with a floor jack positioned under the rear axle. Place jack stands under the frame rails, a few inches in front of the rear springs' front hangers. Ease the jack down until the frame is resting on the stands. Keep a slight load on the jack. Chock front tires.

2. Remove the tires. Unbolt the shock absorbers from the axle.

3. Remove the spring-to-axle U-bolts. Use the jack to carefully lower the axle down enough for block installation. Do not overextend the brake and axle vent hoses, or any wiring.

4. When a vehicle is factory equipped with lift blocks, generally the factory blocks have an arm that acts as a contact point for the compression travel stop. The supplied blocks should be positioned UNDERNEATH the factory blocks.

5. Inspect the block-to-spring perch contact area. The spring perch must be perfectly flat in order for the blocks to seat properly. If the perches are not perfectly flat, they must be repaired or replaced before continuing.

6. Be sure the spring perches are clean and free of debris. Inspect the supplied lift blocks; if there is a taper present in the block, position the block so that the "tall" end of the taper faces rearward and the "short" end faces forward. Be sure that the spring centering pin(s) are seated properly in the hole(s) of the blocks, and that the block pin seats properly in the spring perch. Position the spring-to-axle U-bolts and install the furnished U-bolt flat washers using the stock U-bolt retaining plate. Evenly tighten the U-bolts using an "X" pattern.

½" U-bolts…….75-80 ft-lbs.
9/16" U-bolts….85-90 ft-lbs.
5/8" U-bolts……90-110 ft-lbs.

7. Install the new shock absorbers or reconnect old shocks (if applicable). Reinstall tires and torque to factory specifications. Lower the vehicle to the floor.

8. Check the length of the brake hose, axle vent hose, parking brake cables, and so on for adequate slack with the suspension hanging at full extension travel.

9. Re-torque the U-bolts after 100 miles and periodically thereafter.

Important Product Use Information

As a general rule, the taller a vehicle is the easier it will roll. We strongly recommend , because of rollover possibility, that Seat belts and shoulder harness be worn at all times. Avoid situations where a side rollover may occur.

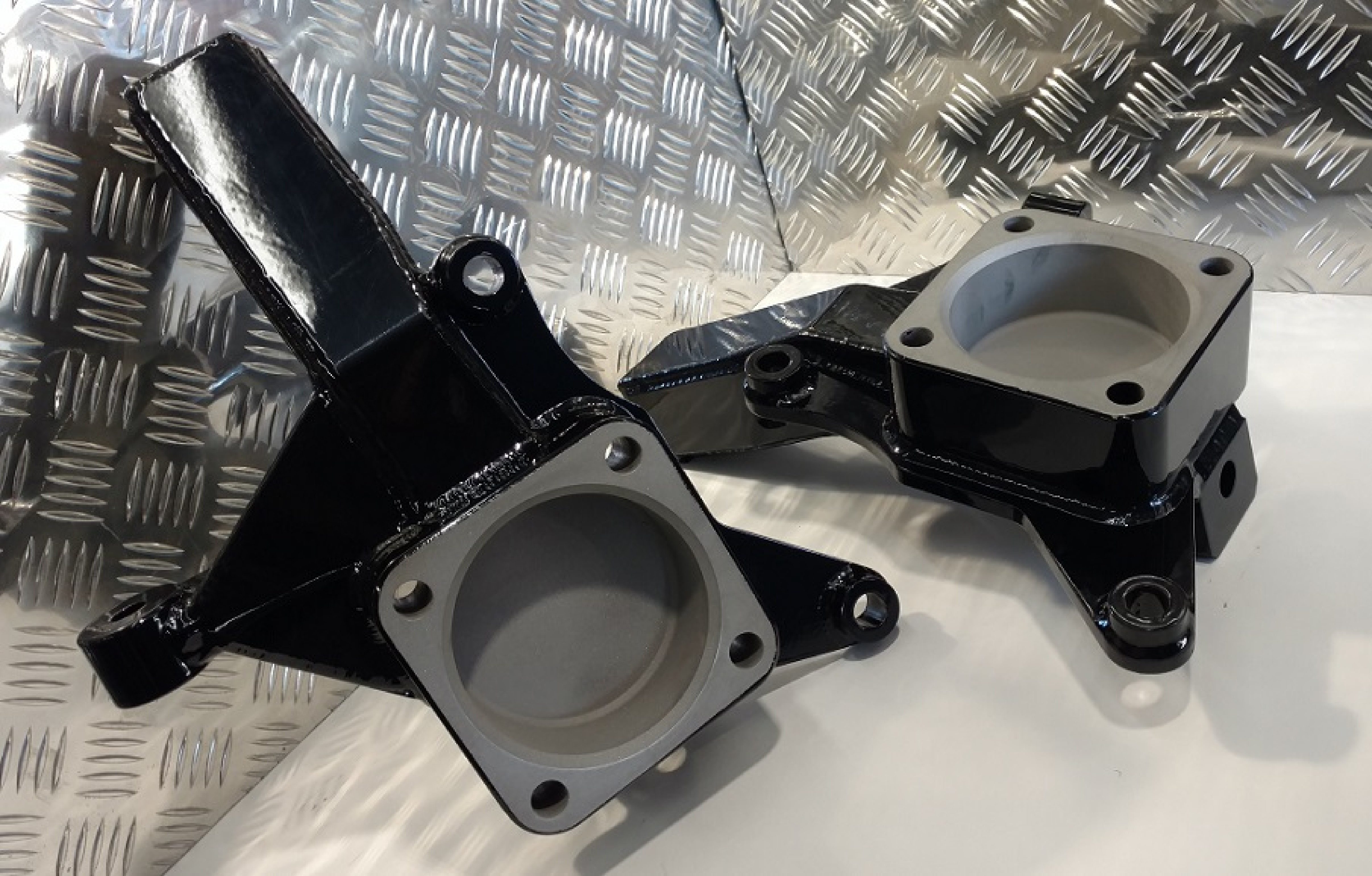
Braking performance and capabilities are decreased when significantly large/heaver tires and wheels are used. Take this into consideration while driving, also , speedometer recalibration is necessary when larger tires are installed.

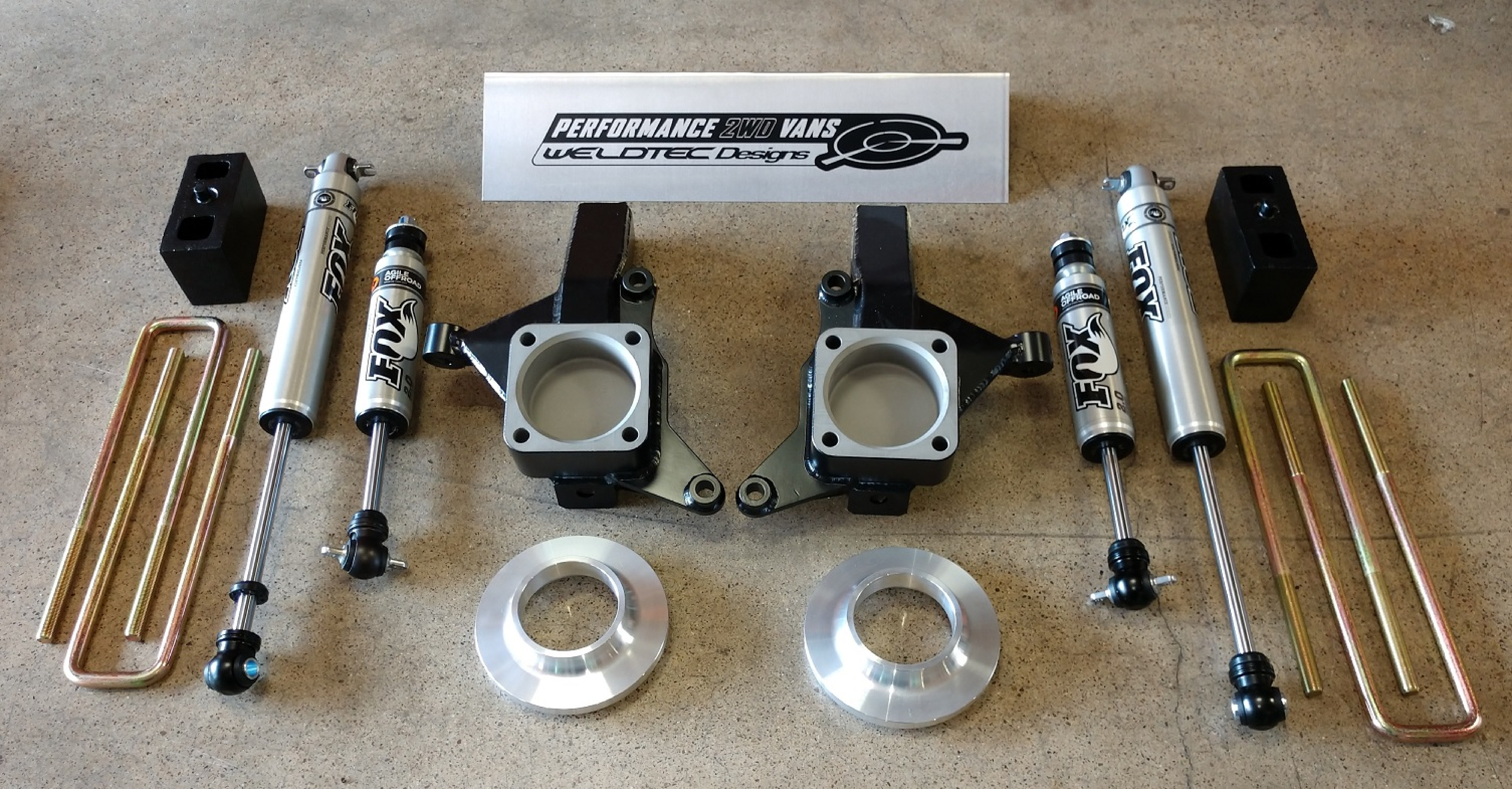
Do not add, alter, or fabricate any factory or after-market parts which increase vehicle height over the intended height of the Daystar Product purchased. Mixing component brands, lifts, and/or combining body lift with suspension lift voids all warranties. Daystar makes no claims regarding lifting devices and excludes any and all implied claims. We will not be responsible for any products that are altered.

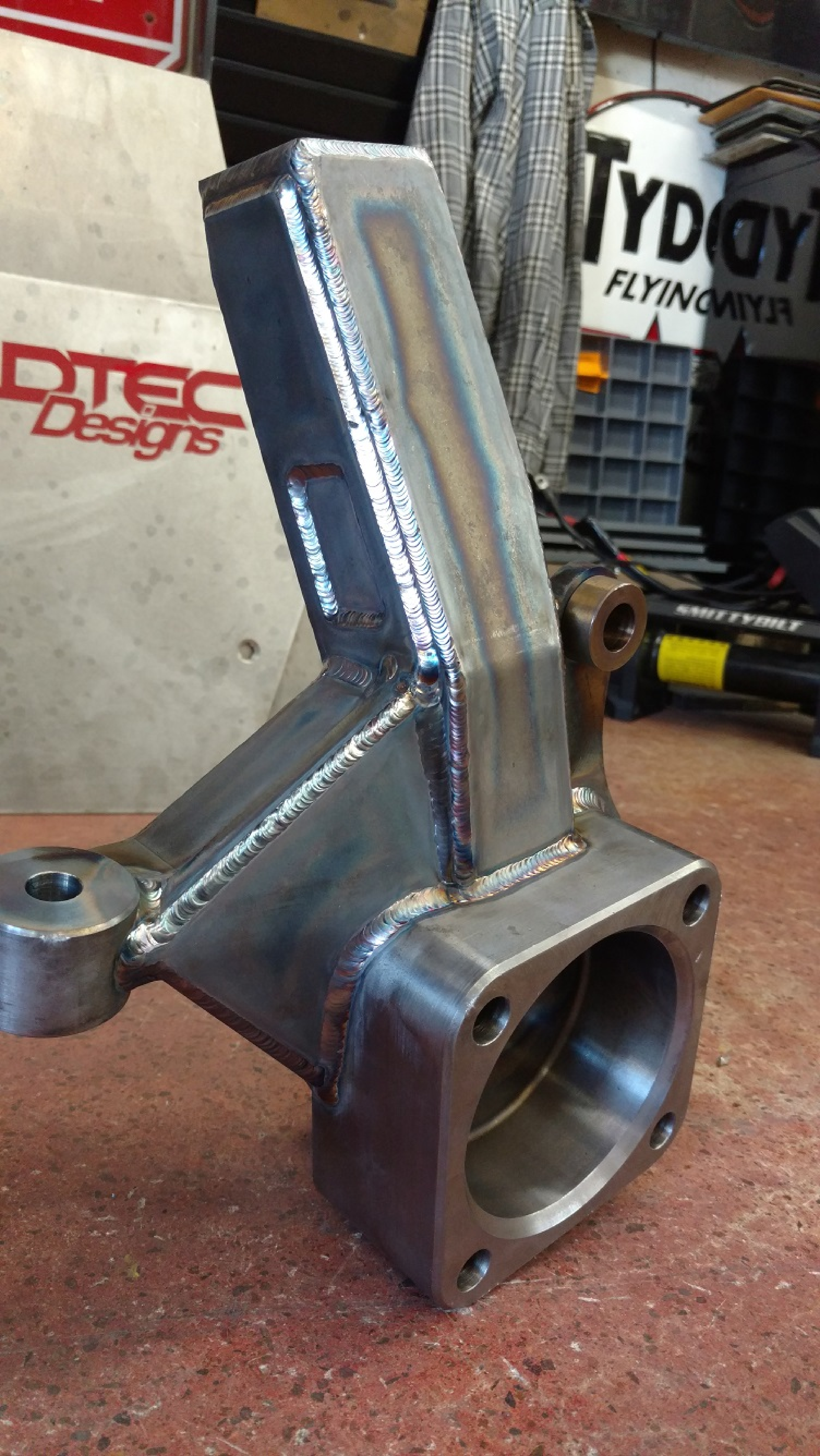
Notice to Dealer and Vehicle Owner

Any vehicle equipped with any Daystar Product must have the “Warning to driver” decal installed on the sun visor or dash. The decal is to act a constant reminder for whoever is operating the vehicle of its unique handling characteristics. INSTALLING DEALER— Its is your responsibility to install the warning decal and forward these instructions on too the vehicle owner for review and to be kept in the vehicle for service life.

After installation occurs, a qualified alignment facility is required to align the vehicle to factory specs.




PERFORMANCE 2WD VANS
WELDTEC Designs
FOX
AGILE OFFROAD
FOX 2.0
AGILE OFFROAD
FOX 2.0
FOX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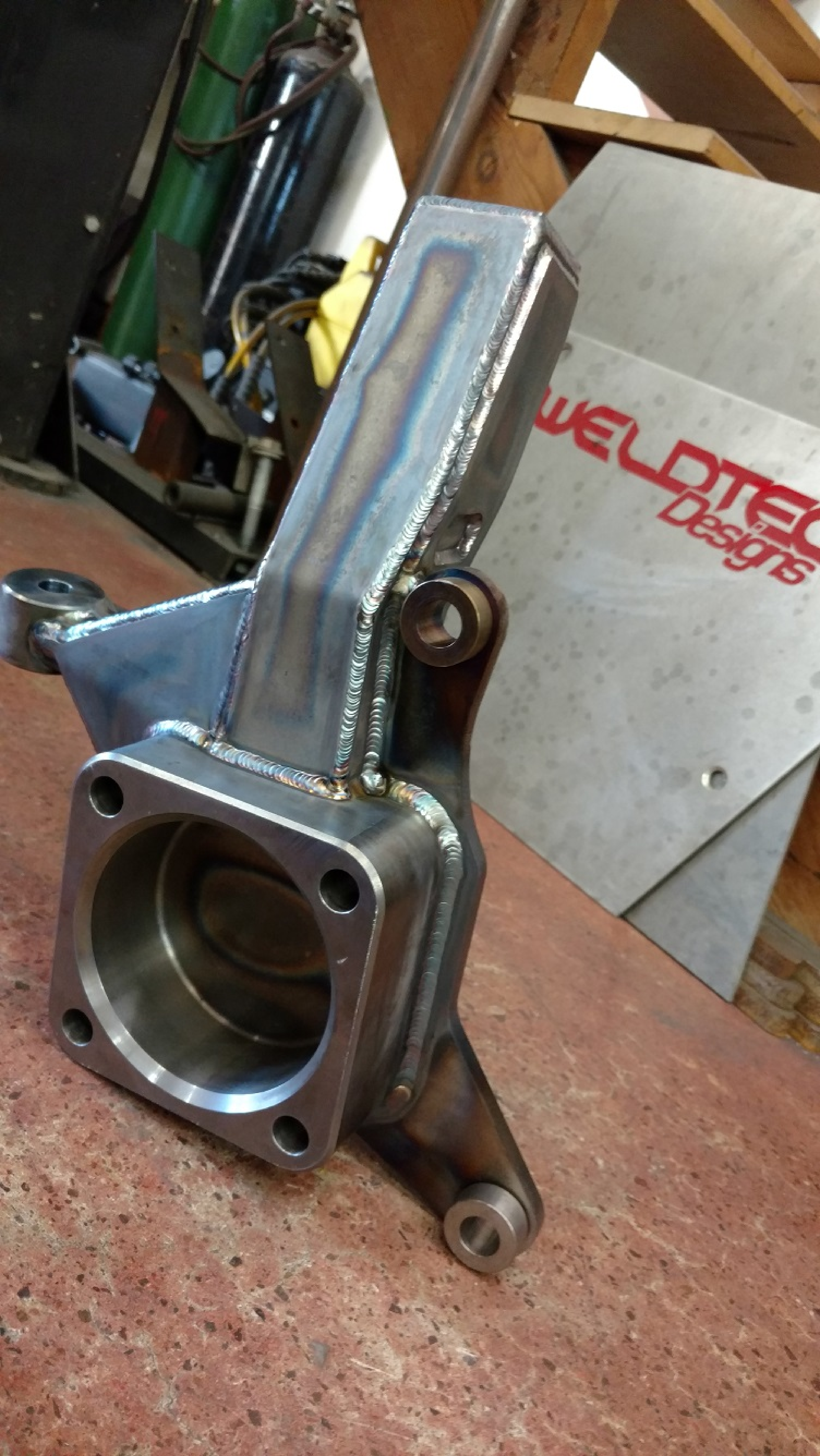

WELDTEC
Designs

CHEVROLET AND GMC

4

Avalanche • Express • Savana • Sierra • Silverado

BRAKES **4-150**
DIESEL ENGINE REPAIR **4-76**
DIESEL FUEL SYSTEM **4-105**
DRIVE TRAIN **4-109**
GASOLINE ENGINE REPAIR ... **4-33**
GASOLINE FUEL SYSTEM **4-98**
SPECIFICATIONS AND MAINTENANCE CHARTS **4-3**
Engine and Vehicle Identification 4-3
General Engine Specifications 4-3
Engine Tune-Up Specifications 4-4
Firing Orders 4-5
Accessory Drive Belt Routing 4-6
Capacities 4-8
Valve Specifications 4-12
Crankshaft and Connecting Rod Specifications 4-13
Piston and Ring Specifications 4-16
Torque Specifications 4-19
Wheel Alignment 4-21
Tire, Wheel and Ball Joint Specifications 4-24
Brake Specifications 4-25
Scheduled Maintenance Intervals 4-27
STEERING AND SUSPENSION **4-131**

A
Air Bag 4-131
  Disarming & Arming 4-131
  Precautions 4-131
Alternator (Diesel Engine Repair)...4-76
  Removal & Installation 4-76
Alternator (Gasoline Engine Repair) 4-36
  Removal 4-36
B
Brake Caliper 4-150
  Removal & Installation 4-150
Brake Drums 4-154
  Removal & Installation 4-154
Brake Shoes 4-154
  Removal & Installation 4-154
C
Camshaft and Valve Lifters (Diesel Engine Repair) 4-90
  Removal & Installation 4-90
Camshaft and Valve Lifters (Gasoline Engine Repair) 4-61
  Removal & Installation 4-61
Clutch 4-116
  Adjustments 4-116
  Removal & Installation 4-116
Coil Springs 4-136
  Removal & Installation 4-136
CV-Joints 4-118
  Overhaul 4-118
Cylinder Head (Diesel Engine Repair) 4-81
  Removal & Installation 4-81
Cylinder Head (Gasoline Engine Repair) 4-48
  Removal & Installation 4-48
D
Diesel Injection Pump 4-106
  Removal & Installation 4-106
Disc Brake Pads 4-152
  Removal & Installation 4-152
Distributor 4-33
  Installation 4-33
  Removal 4-33
E
Engine Assembly (Diesel Engine Repair) 4-76
  Removal & Installation 4-76
Engine Assembly (Gasoline Engine Repair) 4-37
  Removal & Installation 4-37
Exhaust Manifold (Diesel Engine Repair) 4-88
  Removal & Installation 4-88
Exhaust Manifold (Gasoline Engine Repair) 4-59
  Removal & Installation 4-59
F
Front Axle Shaft, Bearing and Seal 4-122
  Removal & Installation 4-122
Front Drive Axle Differential Carrier 4-128
  Removal & Installation 4-128
Front Drive Axle Pinion Seal 4-126
  Removal & Installation 4-126
Fuel Filter (Diesel Engine Repair) 4-105
  Removal & Installation 4-105
Fuel Filter (Gasoline Engine Repair) 4-99
  Removal & Installation 4-99
Fuel Injector (Diesel Engine Repair) 4-107
  Removal & Installation 4-107
Fuel Injectors (Gasoline Engine Repair) 4-101
  Removal & Installation 4-101
Fuel Pump 4-100
  Removal & Installation 4-100
Fuel System Air 4-105
  Bleeding 4-105
Fuel System Pressure (Diesel Engine Repair) 4-105
  Relieving 4-105
Fuel System Pressure (Gasoline Engine Repair) 4-98
  Relieving 4-98
Fuel System Service Precautions 4-98
G
Glow Plugs 4-81
  Removal & Installation 4-81
Glow Plugs 4-109
  Removal & Installation 4-109
H
Halfshaft 4-117
  Removal & Installation 4-117
Heater Core (Diesel Engine Repair) 4-81
  Removal & Installation 4-81
Heater Core (Gasoline Engine Repair) 4-45
  Removal & Installation 4-45
Hydraulic Clutch System 4-116
  Bleeding 4-116
I
Idle Speed 4-105
  Adjustment 4-105
Ignition Timing 4-37
  Adjustment 4-37
Intake Manifold (Diesel Engine Repair) 4-87
  Removal & Installation 4-87

Intake Manifold (Gasoline Engine Repair) ... 4-55
  Removal & Installation ... 4-55

L

Leaf Springs ... 4-138
  Removal & Installation ... 4-138
Lower Ball Joint ... 4-141
  Removal & Installation ... 4-141
Lower Control Arm and Bushing ... 4-144
  Control Arm Bushing Replacement ... 4-145
  Removal & Installation ... 4-144

O

Oil Pan (Diesel Engine Repair) ... 4-93
  Removal & Installation ... 4-93
Oil Pan (Gasoline Engine Repair) ... 4-64
  Removal & Installation ... 4-64
Oil Pump (Diesel Engine Repair) ... 4-95
  Removal & Installation ... 4-95
Oil Pump (Gasoline Engine Repair) ... 4-68
  Removal & Installation ... 4-68

P

Piston and Ring (Diesel Engine Repair) ... 4-98
  Positioning ... 4-98
Piston and Ring (Gasoline Engine Repair) ... 4-75
  Positioning ... 4-75
Power Steering Pump ... 4-132
  Removal & Installation ... 4-132

R

Rack & Pinion Steering Gear ... 4-133
  Removal & Installation ... 4-133
Rear Axle Shaft, Bearing and Seal ... 4-125
  Removal & Installation ... 4-125
Rear Drive Axle Housing ... 4-129
  Removal & Installation ... 4-129
Rear Drive Axle Pinion Seal ... 4-127
  Removal & Installation ... 4-127
Rear Main Seal (Diesel Engine Repair) ... 4-96
  Removal & Installation ... 4-96
Rear Main Seal (Gasoline Engine Repair) ... 4-70
  Removal & Installation ... 4-70
Recirculating Ball Power Steering Gear ... 4-132
  Removal & Installation ... 4-132
Rocker Arms (Gasoline Engine Repair) ... 4-53
  Removal & Installation ... 4-53
Rocker Arms/Shaft (Diesel Engine Repair) ... 4-83
  Removal & Installation ... 4-83

S

Shock Absorber ... 4-134
  Removal & Installation ... 4-134
Stabilizer Bar ... 4-148
  Removal & Installation ... 4-148
Starter Motor (Diesel Engine Repair) ... 4-83
  Removal & Installation ... 4-83
Starter Motor (Gasoline Engine Repair) ... 4-63
  Removal & Installation ... 4-63
Steering Knuckle ... 4-149
  Removal & Installation ... 4-149

T

Timing Chain, Sprockets, Front Cover and Seal (Diesel Engine Repair) ... 4-96
  Removal & Installation ... 4-96
Timing Chain, Sprockets, Front Cover and Seal (Gasoline Engine Repair) ... 4-71
  Removal & Installation ... 4-71
Timing Gears, Front Cover and Seal ... 4-97
  Removal & Installation ... 4-97
Torsion Bars ... 4-139
  Removal & Installation ... 4-139
Transfer Case Assembly ... 4-116
  Removal & Installation ... 4-116
Transfer Case Encoder Motor ... 4-121
  Removal & Installation ... 4-121
Transmission Assembly ... 4-109
  Removal & Installation ... 4-109
Turbocharger ... 4-86
  Removal & Installation ... 4-86

U

Upper Ball Joint ... 4-141
  Removal & Installation ... 4-141
Upper Control Arm ... 4-144
  Control Arm Bushing Replacement ... 4-144
  Removal & Installation ... 4-144

V

Valve Lash (Diesel Engine Repair) ... 4-92
  Adjustment ... 4-92
Valve Lash (Gasoline Engine Repair) ... 4-63
  Adjustment ... 4-63

W

Water Pump (Diesel Engine Repair) ... 4-79
  Removal & Installation ... 4-79
Water Pump (Gasoline Engine Repair) ... 4-44
  Removal & Installation ... 4-44
Wheel Bearings ... 4-146
  Adjustment ... 4-146
Wheel Hub, Bearings and Seal ... 4-146
  Removal & Installation ... 4-146

SPECIFICATIONS AND MAINTENANCE CHARTS

ENGINE AND VEHICLE IDENTIFICATION

Engine						
Code ①	Liters (cc)	Cu. In.	Cyl.	Fuel Sys.	Engine Type	Eng. Mfg.
W	4.3 (4293)	263	6	MFI	OHV	CPC
X	4.3 (4293)	263	6	MFI	OHV	CPC
V	4.8 (4802)	293	8	MFI	OHV	CPC
M	5.0 (4999)	305	8	MFI	OHV	CPC
T	5.3 (5327)	325	8	MFI	OHV	CPC
T	5.3 (5327)	325	8	MFI	OHV	CPC
Z	5.3 (5327)	325	8	MFI	OHV	CPC
R	5.7 (5735)	350	8	MFI	OHV	CPC
N	6.0 (5966)	364	8	MFI	OHV	CPC
U	6.0 (5966)	364	8	MFI	OHV	CPC
F	6.5 (6473)	395	8	DSL	OHV	CPC
1	6.6 (6599)	364	8	DSL	OHV	CPC
2	6.6 (6599)	364	8	DSL	OHV	CPC
G	8.1 (8128)	496	8	MFI	OHV	CPC

Model Year	
Code ②	Year
1	2001
2	2002
3	2003
4	2004
5	2005
6	2006

CPC: Chevrolet/Pontiac/Canada

DSL: Diesel

MFI: Multi-port Fuel Injection

① 8th position of VIN

② 10th position of VIN

06025-AVAL-C01

GENERAL ENGINE SPECIFICATIONS

Engine Displ. Liters	Engine VIN	Models	Years	Net Horsepower @ rpm	Net Torque @ rpm (ft. lbs.)	Bore x Stroke (in.)	Com-pression Ratio	Oil Pressure @ rpm
4.3	W	G-1500/2500 Sierra/Silverado	2002 2002	200@4600	260@2800	4.00x3.48	9.2:1	18@2000
4.3	X	Express/Savana Sierra/Silverado	2002-06 2002-06	200@4600	260@2800	4.00x3.48	9.2:1	18@2000
4.8	V	Avalanche Express/Savana Sierra/Silverado	2003-06 2003-06 2003-06	210@4400	290@3250	3.78x3.27	9.5:1	18@2000
5.0	M	G1500/2500	2002	220@4600	280@2800	3.74x3.48	9.4:1	18@2000
5.3	B	Sierra/Silverado	2005-06	285@4000	360@4000	3.78x3.62	9.9:1	18@2000
5.3	T	Avalanche Express/Savana Sierra/Silverado	2002-06 2003-06 2002-06	285@4000	360@4000	3.78x3.62	9.5:1	18@2000
5.3	Z	Avalanche Sierra/Silverado	2002-06 2002-06	285@4000	360@4000	3.78x3.62	9.5:1	18@2000
5.7	R	G1500/2500/3500	2002	255@4600	335@2800	4.00x3.48	9.4:1	18@2000
6.0	N	Express/Savana Sierra/Silverado	2003-06 2003-06	300@4400	360@4000	4.00x3.62	9.4:1	18@2000
6.0	U	Avalanche Express/Savana Sierra/Silverado	2003-06 2003-06 2003-06	300@4400	360@4000	4.00x3.62	9.4:1	18@2000
6.5	F	G2500/3500	2002	195@3400	430@1800	4.05x3.80	21.5:1	30-43@2000
6.6	1	Sierra/Silverado	2003-04	300@3000	520@1800	4.00x3.90	17.5:1	57@3250
6.6	2	Sierra/Silverado	2005-06	300@3000	520@1800	4.05x3.90	17.5:1	42@1800
8.1	G	Avalanche Sierra/Silverado	2003-06 2002-06	340@4200	455@3200	4.25x4.37	9.1:1	10@2000

06025-AVAL-C02

GASOLINE ENGINE TUNE-UP SPECIFICATIONS

Year	Engine Displacement Liters	Engine ID/VIN	Spark Plugs Gap (in.)	Ignition Timing (deg.)		Fuel Pump (psi)	Idle Speed (rpm)		Valve Clearance	
				MT	AT		MT	AT	In.	Ex.
2002	4.3	W	0.060	①	①	58-64 ②	600	625	HYD	HYD
	4.8	V	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.0	M	0.060	①	①	60-66 ②	650 ④	550	HYD	HYD
	5.3	T	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	Z	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.7	R	0.060	①	①	60-66 ②	660 ⑤	525	HYD	HYD
	6.0	U	0.060	①	①	55-62 ②	③	③	HYD	HYD
	8.1	G	0.060	①	①	55-62 ②	③	③	HYD	HYD
2003	4.3	X	0.060	①	①	58-64 ②	600	625	HYD	HYD
	4.8	V	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	T	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	Z	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	N	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	U	0.060	①	①	55-62 ②	③	③	HYD	HYD
	8.1	G	0.060	①	①	55-62 ②	③	③	HYD	HYD
2004	4.3	X	0.060	①	①	58-64 ②	600	625	HYD	HYD
	4.8	V	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	T	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	Z	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	N	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	U	0.060	①	①	55-62 ②	③	③	HYD	HYD
	8.1	G	0.060	①	①	55-62 ②	③	③	HYD	HYD
2005	4.3	X	0.060	①	①	55-62 ②	600	625	HYD	HYD
	4.8	V	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	B	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	T	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	Z	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	N	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	U	0.060	①	①	55-62 ②	③	③	HYD	HYD
	8.1	G	0.060	①	①	55-62 ②	③	③	HYD	HYD
2006	4.3	X	0.060	①	①	55-62 ②	600	625	HYD	HYD
	4.8	V	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	B	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	T	0.060	①	①	55-62 ②	③	③	HYD	HYD
	5.3	Z	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	N	0.060	①	①	55-62 ②	③	③	HYD	HYD
	6.0	U	0.060	①	①	55-62 ②	③	③	HYD	HYD
	8.1	G	0.060	①	①	55-62 ②	③	③	HYD	HYD

NOTE: The Vehicle Emission Control Information label often reflects specification changes made during production.

The label figures must be used if they differ from those in this chart.

HYD: Hydraulic

① Ignition timing is preset and cannot be adjusted

② With key ON and engine OFF

③ Idle speed is maintained by the Powertrain Control Module (PCM)

④ Under 8500 GVW

⑤ Over 8500 GVW

06025-AVAL-C03

DIESEL ENGINE TUNE-UP SPECIFICATIONS

Year	Engine Displacement Liters	Engine ID/VIN	Valve Clearance		Intake Valve Opens (deg.)	Injection Pump Setting (deg.)	Injection Nozzle Pressure (psi)		Idle Speed (rpm)	Cranking Compression Pressure (psi)
			Intake (in.)	Exhaust (in.)			New	Used		
2002	6.5	F	HYD	HYD	①	①	1800	1700	①	380-400
	6.6	1	HYD	HYD	①	①	1800	1700	①	380-400
2003	6.6	1	HYD	HYD	①	①	1800	1700	①	380-400
2004	6.6	1	HYD	HYD	①	①	1800	1700	①	380-400
2005	6.6	2	HYD	HYD	①	①	NA	NA	①	380-400
2006	6.6	2	HYD	HYD	①	①	NA	NA	①	380-400

NOTE: The Vehicle Emission Control Information label often reflects specification changes made during production.

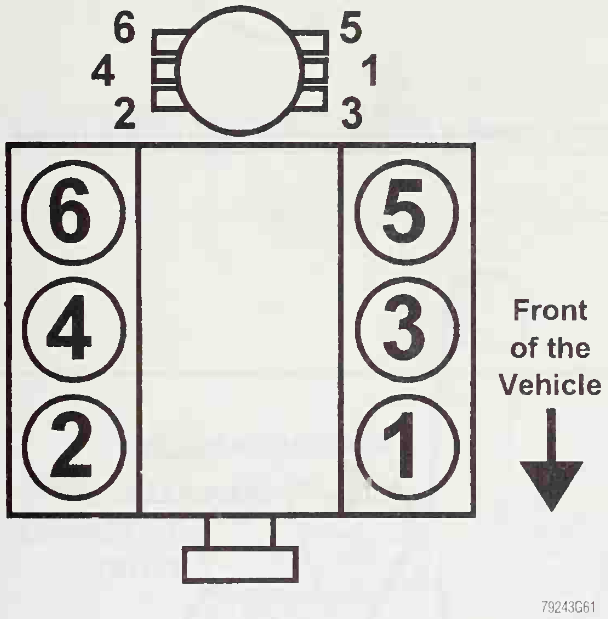
The label figures must be used if they differ from those in this chart.

HYD: Hydraulic

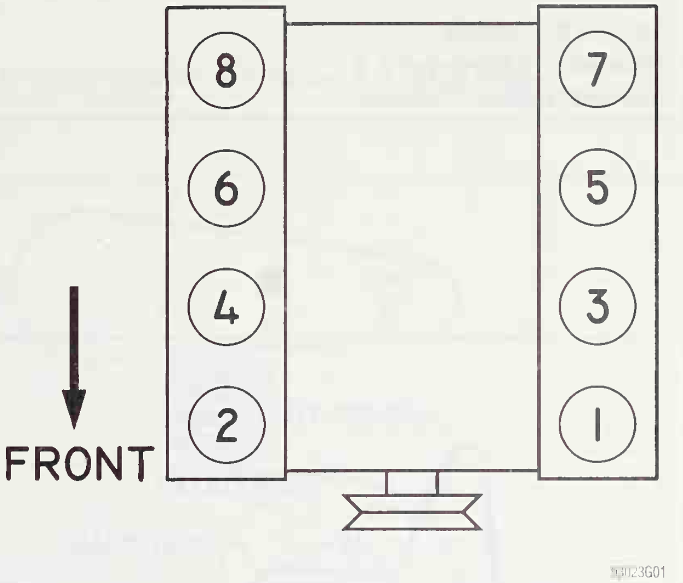
NA: Not Available

① Refer to Vehicle Emission Control Information label

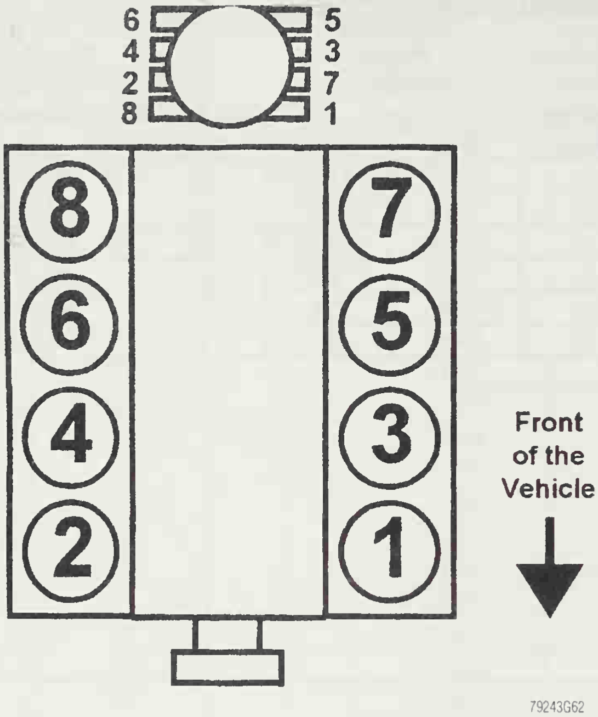
06025-AVAL-C04



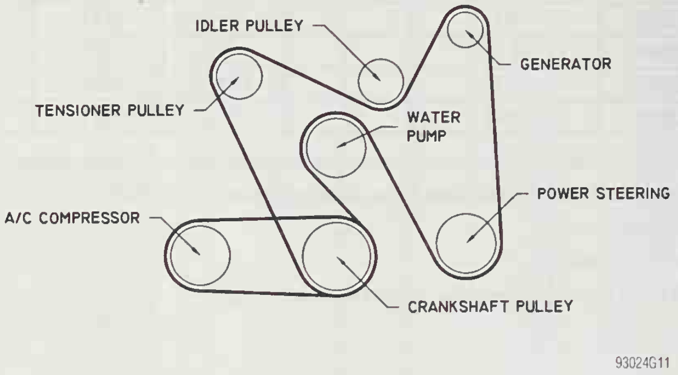
4.3L Engines
Firing order: 1-6-5-4-3-2
Distributor rotation: Clockwise



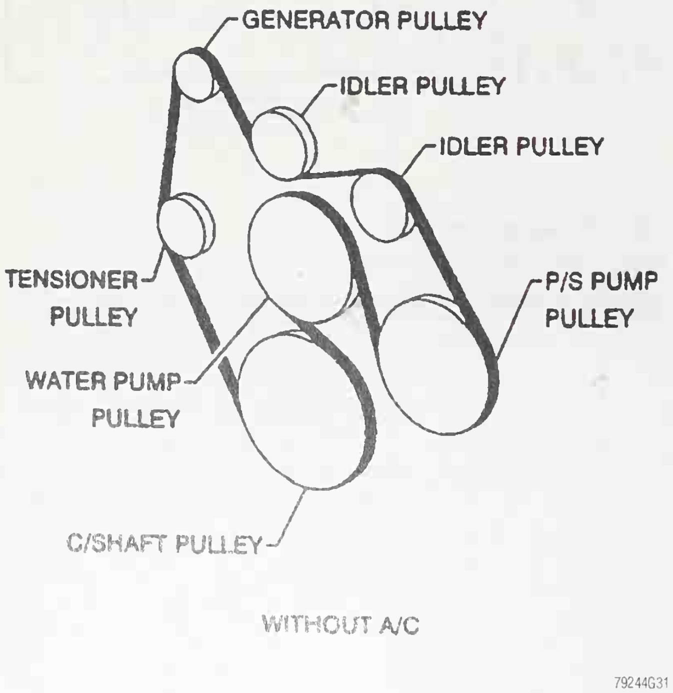
4.8L, 5.3L and 6.0L Engines
Firing order: 1-8-7-2-6-5-4-3
Distributorless ignition system (one coil on each cylinder)


6 5
4 3
2 7
8 1
8
7
6
5
4
3
2
1
Front of the Vehicle
79243G62

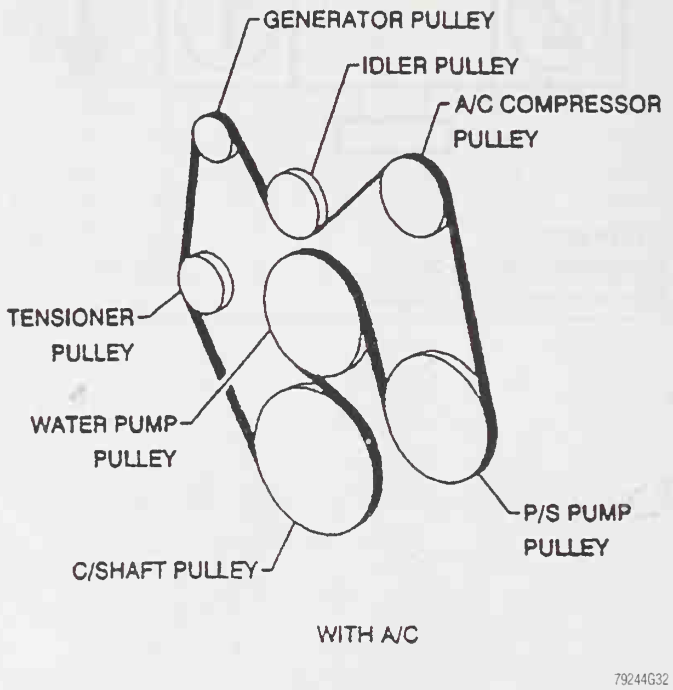
5.0L and 5.7L Engines
Firing order: 1–8–4–3–6–5–7–2
Distributor rotation: Clockwise


IDLER PULLEY
GENERATOR
TENSIONER PULLEY
WATER PUMP
POWER STEERING
A/C COMPRESSOR
CRANKSHAFT PULLEY
93024G11

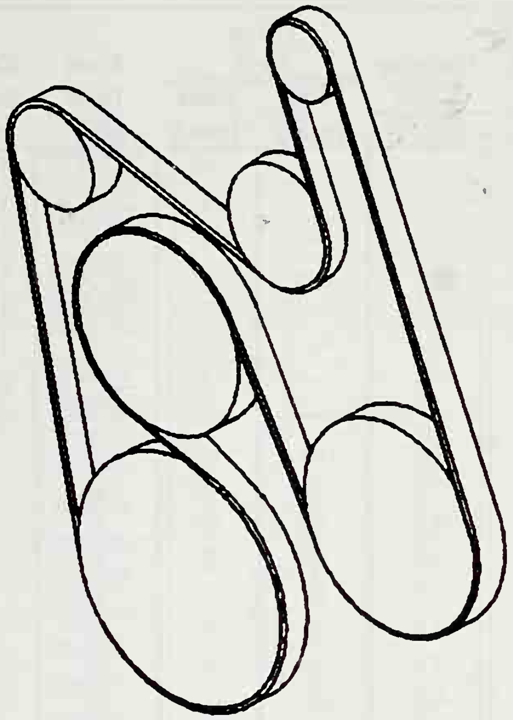
Accessory serpentine belt routing—4.8L, 5.3L and 6.0L engines


GENERATOR PULLEY
IDLER PULLEY
IDLER PULLEY
TENSIONER PULLEY
P/S PUMP PULLEY
WATER PUMP PULLEY
C/SHAFT PULLEY
WITHOUT A/C
79244G31

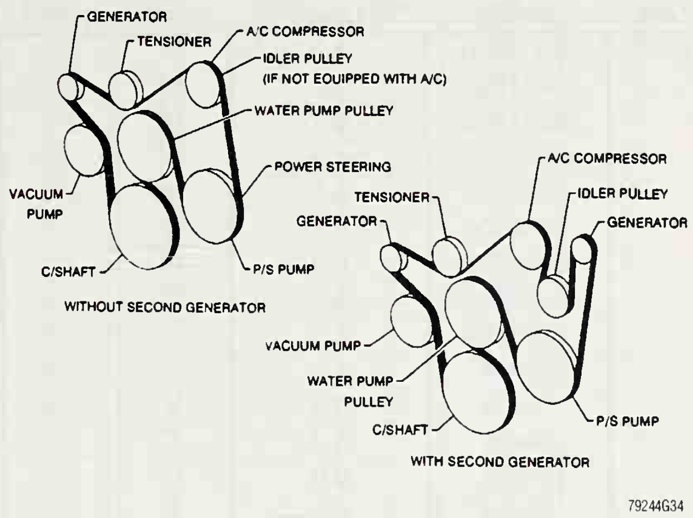
Accessory serpentine belt routing—4.3L, 5.0L and 5.7L engines without A/C


GENERATOR PULLEY
IDLER PULLEY
A/C COMPRESSOR PULLEY
TENSIONER PULLEY
WATER PUMP PULLEY
P/S PUMP PULLEY
C/SHAFT PULLEY
WITH A/C
79244G32

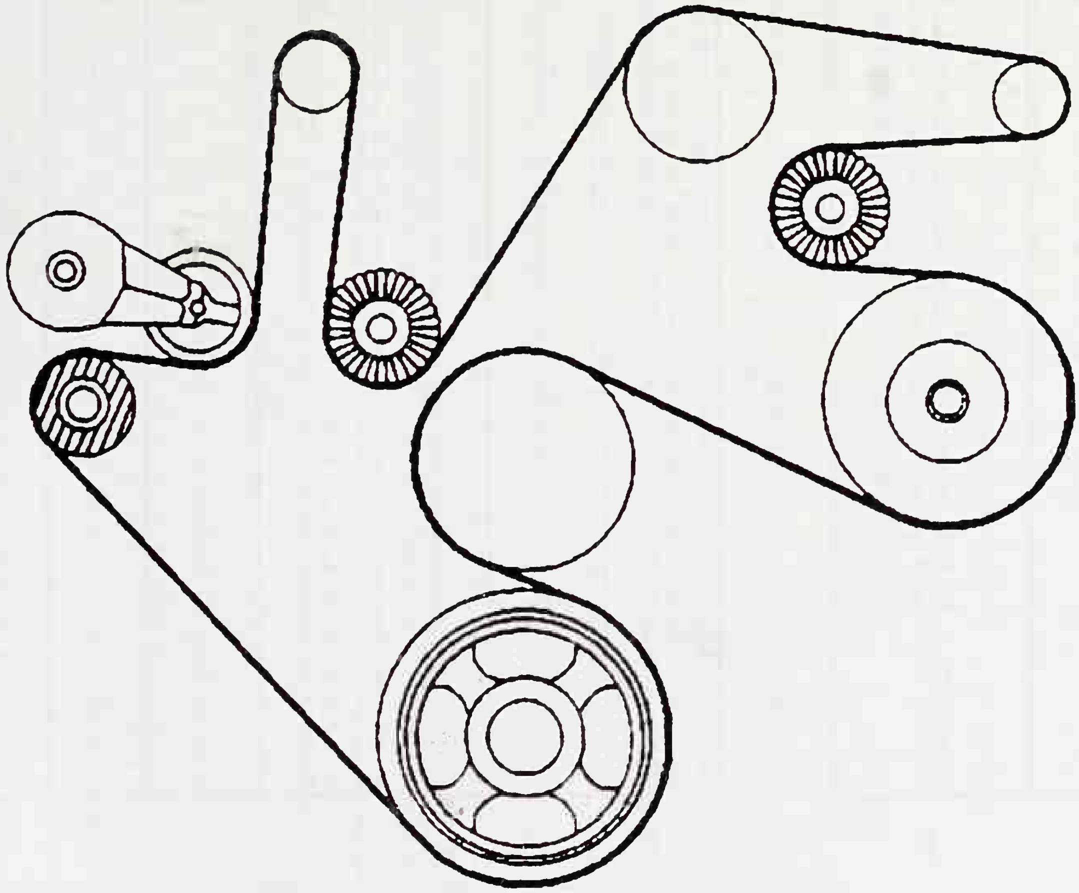
Accessory serpentine belt routing—4.3L, 5.0L and 5.7L engines with A/C



Accessory serpentine belt routing—8.1L engine


GENERATOR
TENSIONER
A/C COMPRESSOR
IDLER PULLEY
(IF NOT EQUIPPED WITH A/C)
WATER PUMP PULLEY
POWER STEERING
VACUUM PUMP
C/SHAFT
P/S PUMP
WITHOUT SECOND GENERATOR
A/C COMPRESSOR
TENSIONER
IDLER PULLEY
GENERATOR
GENERATOR
VACUUM PUMP
WATER PUMP PULLEY
C/SHAFT
P/S PUMP
WITH SECOND GENERATOR
79244G34

Accessory serpentine belt routing—6.5L Diesel engines



Accessory serpentine belt routing—6.6L Diesel engines

CAPACITIES

Year	Model	Engine Displacement Liters	Engine ID/VIN	Engine Oil with Filter (qts.)	Transmission (pts.)		Transfer Case (pts.)	Drive Axle		Fuel Tank (gal.)	Cooling System (qts.)
					5-Spd	Auto.		Front (pts.)	Rear (pts.)		
2002	G/P1500	4.3	W	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	G/P1500	5.0	M	5.0	①	②	—	—	③	22.0 ④	17.0 ⑤
	G/P1500	5.7	R	5.0	①	②	—	—	③	④	18.0 ⑤
	G/P2500	4.3	W	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	G/P2500	5.0	M	5.0	①	②	—	—	③	22.0 ④	17.0 ⑤
	G/P2500	5.7	R	5.0	①	②	—	—	③	④	18.0 ⑤
	G/P2500	6.5	F	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	G/P3500	6.5	F	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	G/P3500	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
	Sierra	4.3	W	4.5	⑥	⑦	4.8	⑧	⑨	⑩	⑫
	Sierra	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑬
	Sierra	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Sierra	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Sierra	6.6	1	8.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Sierra	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
	Silverado	4.3	W	4.5	⑥	⑦	4.8	⑧	⑨	⑩	⑫
	Silverado	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑬
	Silverado	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Silverado	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Silverado	6.6	1	8.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Silverado	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
2003	Express	4.3	X	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	Express	4.8	V	5.0	①	②	—	—	③	22.0 ④	17.0 ⑤
	Express	5.3	T	5.0	①	②	—	—	③	④	18.0 ⑤
	Express	5.3	Z	5.0	①	②	—	—	③	④	18.0 ⑤
	Express	6.0	U	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	Express	6.0	N	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	Savana	4.3	X	5.0	①	②	—	—	③	22.0 ④	17.0 ⑤
	Savana	4.8	V	5.0	①	②	—	—	③	④	18.0 ⑤
	Savana	5.3	T	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Savana	5.3	Z	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Savana	6.0	U	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Savana	6.0	N	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Avalanche	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Avalanche	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Avalanche	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
	Sierra	4.3	X	4.5	⑥	⑦	4.8	⑧	⑨	⑩	⑫
	Sierra	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑬
	Sierra	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Sierra	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Sierra	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Sierra	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Sierra	6.6	1	8.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Sierra	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪

06025-AVAL-C05

CAPACITIES

Year	Model	Engine Displacement Liters	Engine ID/VIN	Engine Oil with Filter (qts.)	Transmission (pts.)		Transfer Case (pts.)	Drive Axle		Fuel Tank (gal.)	Cooling System (qts.)
					5-Spd	Auto.		Front (pts.)	Rear (pts.)		
2003 Cont.	Silverado	4.3	X	4.5	⑥	⑦	4.8	⑧	⑨	⑩	⑫
	Silverado	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑬
	Silverado	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Silverado	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Silverado	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Silverado	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Silverado	6.6	1	8.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Silverado	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
2004	Express	4.3	X	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	Express	4.8	V	5.0	①	②	—	—	③	22.0 ④	17.0 ⑤
	Express	5.3	T	5.0	①	②	—	—	③	④	18.0 ⑤
	Express	5.3	Z	5.0	①	②	—	—	③	④	18.0 ⑤
	Express	6.0	U	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	Express	6.0	N	5.0	①	②	—	—	③	22.0 ④	13.0 ⑤
	Savana	4.3	X	5.0	①	②	—	—	③	22.0 ④	17.0 ⑤
	Savana	4.8	V	5.0	①	②	—	—	③	④	18.0 ⑤
	Savana	5.3	T	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Savana	5.3	Z	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Savana	6.0	U	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Savana	6.0	N	7.0	①	②	—	—	③	22.0 ④	27.5 ⑤
	Sierra	4.3	X	4.5	⑥	⑦	4.8	⑧	⑨	⑩	⑫
	Sierra	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑬
	Sierra	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Sierra	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Sierra	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Sierra	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Sierra	6.6	1	8.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Sierra	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
	Avalanche	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Avalanche	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Avalanche	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
	Silverado	4.3	X	4.5	⑥	⑦	4.8	⑧	⑨	⑩	⑫
	Silverado	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑬
	Silverado	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Silverado	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑭
	Silverado	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Silverado	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑮
	Silverado	6.6	1	8.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Silverado	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	⑪
2005	Express	4.3	X	4.5	—	⑰	—	—	NA	31.0 ④	11.0 ⑤
	Express	4.8	V	6.0	—	⑰	—	—	NA	31.0 ④	13.4 ⑤
	Express	5.3	T	6.0	—	⑰	—	—	③	31.0 ④	13.4 ⑤
	Express	6.0	N	6.0	—	⑰	—	—	③	31.0 ④	14.8 ⑤
	Savana	4.3	X	4.5	—	⑰	—	—	NA	31.0 ④	11.0 ⑤
	Savana	4.8	V	6.0	—	⑰	—	—	NA	31.0 ④	13.4 ⑤
	Savana	5.3	T	6.0	—	⑰	—	—	③	31.0 ④	13.4 ⑤
	Savana	6.0	N	6.0	—	⑰	—	—	③	31.0 ④	14.8 ⑤

06025-AVAL-C06

CAPACITIES

Year	Model	Engine Displacement Liters	Engine ID/VIN	Engine Oil with Filter (qts.)	Transmission (pts.)		Transfer Case (pts.)	Drive Axle		Fuel Tank (gal.)	Cooling System (qts.)
					5-Spd	Auto.		Front (pts.)	Rear (pts.)		
2005	Sierra	4.3	X	4.5	⑥	⑦	4.0	⑧	⑨	⑩	⑱
Cont.	Sierra	4.8	V	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	5.3	B	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	5.3	T	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	5.3	Z	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Sierra	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Sierra	6.6	2	10.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Sierra	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	㉑
	Silverado	4.3	X	4.5	⑥	⑦	4.0	⑧	⑨	⑩	⑱
	Silverado	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Silverado	5.3	B	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Silverado	5.3	T	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Silverado	5.3	Z	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Silverado	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Silverado	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Silverado	6.6	2	10.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Silverado	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	㉑
	Avalanche	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Avalanche	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Avalanche	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Avalanche	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Avalanche	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	㉑
2006	Express	4.3	X	4.5	—	⑰	—	—	NA	31.0 ④	11.0 ⑤
	Express	4.8	V	6.0	—	⑰	—	—	NA	31.0 ④	13.4 ⑤
	Express	5.3	T	6.0	—	⑰	—	—	③	31.0 ④	13.4 ⑤
	Express	6.0	N	6.0	—	⑰	—	—	③	31.0 ④	14.8 ⑤
	Savana	4.3	X	4.5	—	⑰	—	—	NA	31.0 ④	11.0 ⑤
	Savana	4.8	V	6.0	—	⑰	—	—	NA	31.0 ④	13.4 ⑤
	Savana	5.3	T	6.0	—	⑰	—	—	③	31.0 ④	13.4 ⑤
	Savana	6.0	N	6.0	—	⑰	—	—	③	31.0 ④	14.8 ⑤
	Sierra	4.3	X	4.5	⑥	⑦	4.0	⑧	⑨	⑩	⑱
	Sierra	4.8	V	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	5.3	B	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	5.3	T	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	5.3	Z	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Sierra	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Sierra	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Sierra	6.6	2	10.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Sierra	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	㉑

06025-AVAL-C07

CAPACITIES

Year	Model	Engine Displacement Liters	Engine ID/VIN	Engine Oil with Filter (qts.)	Transmission (pts.)		Transfer Case (pts.)	Drive Axle		Fuel Tank (gal.)	Cooling System (qts.)
					5-Spd	Auto.		Front (pts.)	Rear (pts.)		
2006 Cont.	Silverado	4.3	X	4.5	⑥	⑦	4.0	⑧	⑨	⑩	⑱
	Silverado	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Silverado	5.3	B	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Silverado	5.3	T	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Silverado	5.3	Z	6.0	⑥	⑦	4.0	⑧	⑨	⑩	⑲
	Silverado	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Silverado	6.0	N	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Silverado	6.6	2	10.0	⑥	⑦	4.8	⑧	⑨	⑩	⑯
	Silverado	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	㉑
	Avalanche	4.8	V	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Avalanche	5.3	T	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Avalanche	5.3	Z	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑲
	Avalanche	6.0	U	6.0	⑥	⑦	4.8	⑧	⑨	⑩	⑳
	Avalanche	8.1	G	6.5	⑥	⑦	4.8	⑧	⑨	⑩	㉑

NOTE: All capacities are approximate. Add fluid gradually and check to be sure a proper fluid level is obtained.

① New Venture gear 4500: 8.0 pts.
New Venture gear 5LM60: 4.4 pts.

② 4L60E trans.: 10.0 pts.
4L80E trans.: 14.5 pts.

③ 8.5 in. ring gear: 4.2 pts.
9.5 in. ring gear: 6.5 pts.
9.75 in. ring gear: 6.0 pts.
10.5 in. ring gear: 6.5 pts.

④ Optional 31 and 40 gallon on 2002-04
Optional 33 and 57 gallon on 2005-06

⑤ Add three qts. with rear heater

⑥ New Venture Gear 3500: 4.8 pts.
New Venture Gear 4500: 8.0 pts.
6-speed M/T: 12.6 pts.

⑦ 4L60-E: 10 pts.
4L80-E: 15.4 pts.
Allison: 14.8 pts.

⑧ 8.25 in ring gear: 3.5 pts.
9.25 ring gear: 3.7 pts.

⑨ 8.6 in. ring gear: 4.3 pts.
9.5 & 10.5 in. ring gear: 5.5 pts.
9.75 in. ring gear: 6.0 pts.
11.5 in. ring gear: 6.3 pts.

⑩ Short bed: 26 gals.
Long bed: 34 gals.

⑪ With A/T: 20.7 qts.
With M/T: 21.1 qts.

⑫ With A/T: 12.6 qts.
With M/T: 12.9 qts.

⑬ With A/T: 13.4 qts.
With M/T: 13.7 qts.
With A/T and front A/C: 14.4 qts.
With A/T and front and rear A/C: 15.8 qts.

⑭ With A/T: 13.4 qts.
With A/T and optional A/C: 14.9 qts.
With A/T and front A/C: 14.4 qts.
With A/T and front and rear A/C: 15.8 qts.

⑮ With A/T: 14.8 qts.
With A/T and optional oil cooler: 14.4 qts.
With M/T: 15.2 qts.
With M/T and optional oil cooler: 15.8 qts.

⑯ With A/T: 20.3 qts.
With M/T: 20.7 qts.

⑰ 4L60-E: 17.6 pts. with 245 converter
4L60-E: 19.4 pts. with 258 converter
4L60-E: 22.4 pts. with 298 converter
4L80-E: 15.4 pts.

⑱ With A/T non electric fan: 14.8 qts.
With A/T electric fan: 16.5 qts.
With M/T non-electric fan: 15.1 qts.
With M/T electric fan: 16.6 qts.

⑲ With A/T non electric fan: 15.2 qts.
With A/T electric fan: 16.8 qts.
With M/T non-electric fan: 15.5 qts.
With M/T electric fan: 17.0 qts.

⑳ With A/T: 16.4 qts.
With A/T electric fan: 16.8 qts.

㉒ With A/T Light Duty: 26.9 qts.
With A/T Heavy Duty: 25.0 qts.

06025-AVAL-C08

VALVE SPECIFICATIONS

Engine Displ. Liters	Engine VIN	Years	Seat Angle (deg.)	Face Angle (deg.)	Spring Test Pressure (lbs. @ in.)	Spring Installed Height (in.)	Stem-to-Guide Clearance (in.)		Stem Diameter (in.)	
							Intake	Exhaust	Intake	Exhaust
4.3	W	2002	46	45	187-203@1.27	1.67-1.71	0.0010-0.0027	0.0010-0.0027	NA	NA
4.3	X	2003-06	46	45	187-203@1.27	1.67-1.71	0.0010-0.0027	0.0010-0.0027	NA	NA
4.8	V	2002-06	46	45	220@1.32	1.800	0.0010-0.0026	0.0010-0.0026	0.3132-0.3140	0.3132-0.3140
5.0	M	2002	46	45	187-203@1.27	1.69-1.71	0.0010-0.0027	0.0010-0.0027	NA	NA
5.3	B	2005-06	46	45	220@1.32	1.800	0.0010-0.0026	0.0010-0.0026	0.3130-0.3140	0.3130-0.3140
5.3	T	2002-06	46	45	220@1.32	1.800	0.0010-0.0026	0.0010-0.0026	0.3130-0.3140	0.3130-0.3140
5.3	Z	2003-06	46	45	220@1.32	1.800	0.0010-0.0026	0.0010-0.0026	0.3130-0.3140	0.3130-0.3140
5.7	R	2002	46	45	187-203@1.27	1.69-1.71	0.0010-0.0027	0.0010-0.0027	NA	NA
6.0	N	2002-06	46	45	230@1.40	1.800	0.0010-0.0026	0.0010-0.0026	0.3130-0.3140	0.3130-0.3140
6.0	U	2002-06	46	45	230@1.40	1.800	0.0010-0.0027	0.0010-0.0027	0.3130-0.3140	0.3130-0.3140
6.5	F	2002	46	45	220@1.32	1.800	0.0010-0.0026	0.0010-0.0026	NA	NA
6.6	1	2002-04	45	45	NA	1.610	0.0012-0.0025	0.0015-0.0028	0.2737-0.2744	0.2734-0.2741
6.6	2	2005-06	45	45	NA	1.610	0.0012-0.0025	0.0015-0.0028	0.2737-0.2744	0.2734-0.2741
8.1	G	2002-06	46	45	216-236@1.34	1.81-1.84	0.0010-0.0029	0.0012-0.0031	0.3715-0.3722	0.3713-0.3720

06025-AVAL-C09

CRANKSHAFT AND CONNECTING ROD SPECIFICATIONS

All measurements are given in inches.

	Engine		Crankshaft				Connecting Rod		
Year	Displacement Liters	Engine ID/VIN	Main Brg. Journal Dia.	Main Brg. Oil Clearance	Shaft End-play	Thrust on No.	Journal Diameter	Oil Clearance	Side Clearance
2002	4.3	W	①	②	0.0020-0.0070	4	2.2487-2.2497	0.0013-0.0035	0.0060-0.0140
	4.8	V	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.0	M	③	④	0.0020-0.0080	5	2.0978-2.0998	0.0013-0.0035	0.0060-0.0140
	5.3	T	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.7	R	③	④	0.0020-0.0080	5	2.0978-2.0998	0.0013-0.0035	0.0060-0.0140
	6.0	U	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	6.5	F	⑤	⑥	0.0039-0.0100	3	⑦	0.0018-0.0039	0.0067-0.0248
	6.6	1	3.1459-3.1466	0.0015-0.0028	0.0016-0.0081	NA	2.4789-2.4795	0.0014-0.0030	0.0122-0.0193
	8.1	G	2.7482-2.7489	⑧	0.0050-0.0110	NA	2.1990-2.1996	0.0008-0.0025	0.0151-0.0270
2003	4.3	X	①	②	0.0020-0.0070	4	2.2487-2.2497	0.0013-0.0035	0.0060-0.0140
	4.8	V	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.3	T	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.3	Z	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0006-0.0030	0.0043-0.2000
	6.0	U	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	6.0	N	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0006-0.0030	0.0043-0.2000
	6.6	1	3.1459-3.1466	0.0015-0.0028	0.0016-0.0081	NA	2.4789-2.4795	0.0014-0.0030	0.0122-0.0193
	8.1	G	2.7482-2.7489	⑧	0.0050-0.0110	NA	2.1990-2.1996	0.0008-0.0025	0.0151-0.0270

06025-AVAL-C10

CRANKSHAFT AND CONNECTING ROD SPECIFICATIONS

All measurements are given in inches.

Year	Engine Displacement Liters	Engine ID/VIN	Crankshaft				Connecting Rod		
			Main Brg. Journal Dia.	Main Brg. Oil Clearance	Shaft End-play	Thrust on No.	Journal Diameter	Oil Clearance	Side Clearance
2004	4.3	X	①	②	0.0020-0.0070	4	2.2487-2.2497	0.0013-0.0035	0.0060-0.0140
	4.8	V	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.3	T	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.3	Z	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0006-0.0030	0.0043-0.2000
	6.0	U	2.5580-2.5593	0.0007-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	6.0	N	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0006-0.0030	0.0043-0.2000
	6.6	1	3.1459-3.1466	0.0015-0.0028	0.0016-0.0081	NA	2.4789-2.4795	0.0014-0.0030	0.0122-0.0193
	8.1	G	2.7482-2.7489	⑧	0.0050-0.0110	NA	2.1990-2.1996	0.0008-0.0025	0.0151-0.0270
2005	4.3	X	①	⑨	0.0020-0.0078	4	2.2487-2.2497	0.0015-0.0031	0.0060-0.0173
	4.8	V	2.5580-2.5593	0.0008-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0009-0.0025	0.0043-0.0200
	5.3	B	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.3	T	2.5580-2.5593	0.0008-0.0021	0.0015-0.0078	5	2.0987-2.0999	0.0009-0.0025	0.0043-0.0200
	5.3	Z	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0009-0.0030	0.0043-0.2000
	6.0	N	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0009-0.0025	0.0043-0.2000
	6.0	U	2.5580-2.5593	0.0008-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0009-0.0025	0.0043-0.0200
	6.6	1	3.1459-3.1466	0.0015-0.0028	0.0016-0.0081	NA	2.4764-2.4772	0.0014-0.0030	0.0122-0.0193
	8.1	G	2.7482-2.7489	⑧	0.0050-0.0138	NA	2.1990-2.1996	0.0013-0.0027	0.0151-0.0270

06025-AVAL-C11

CRANKSHAFT AND CONNECTING ROD SPECIFICATIONS

All measurements are given in inches.

	Engine		Crankshaft				Connecting Rod		
Year	Displacement Liters	Engine ID/VIN	Main Brg. Journal Dia.	Main Brg. Oil Clearance	Shaft End-play	Thrust on No.	Journal Diameter	Oil Clearance	Side Clearance
2006	4.3	X	①	⑨	0.0020-0.0078	4	2.2487-2.2497	0.0015-0.0031	0.0060-0.0173
	4.8	V	2.5580-2.5593	0.0008-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0009-0.0025	0.0043-0.0200
	5.3	B	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0006-0.0030	0.0043-0.0200
	5.3	T	2.5580-2.5593	0.0008-0.0021	0.0015-0.0078	5	2.0987-2.0999	0.0009-0.0025	0.0043-0.0200
	5.3	Z	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0009-0.0030	0.0043-0.2000
	6.0	N	2.5580-2.5590	0.0008-0.0021	0.0015-0.0078	5	2.0991-2.0999	0.0009-0.0025	0.0043-0.2000
	6.0	U	2.5580-2.5593	0.0008-0.0021	0.0015-0.0078	5	2.0990-2.1000	0.0009-0.0025	0.0043-0.0200
	6.6	1	3.1459-3.1466	0.0015-0.0028	0.0016-0.0081	NA	2.4764-2.4772	0.0014-0.0030	0.0122-0.0193
	8.1	G	2.7482-2.7489	⑧	0.0050-0.0138	NA	2.1990-2.1996	0.0013-0.0027	0.0151-0.0270

NA - Not Available

① No. 1: 2.4488 in.-2.4495 in.
Nos. 2, 3: 2.4485 in.-2.4494 in.
No. 4: 2.4480 in.-2.4489 in.

② No. 1: 0.0008 in.-0.0020 in.
Nos. 2, 3: 0.0011 in.-0.0023 in.
No. 4: 0.0017 in.-0.0032 in.

③ No. 1: 2.4484 in.-2.4493 in.
Nos. 2, 3, 4: 2.4481 in.-2.4490 in.
No. 5: 2.4479 in.-2.4488 in.

⑥ No. 1, 2, 3, 4: 0.0018 in.-0.0033 in.
No. 5: 0.0022 in.-0.0037 in.

⑦ 2.399 in.-2.400 in. (Green)
2.400 in.-2.401 in. (Yellow)

⑧ No. 1, 2, 3, 4: 0.0008-0.0020 in.
No. 5: 0.0014-0.0026 in.

⑨ No. 1: 0.0008-0.0020 in.
No. 2, 3, 4: 0.0011-0.00236 in.

PISTON AND RING SPECIFICATIONS

All measurements are given in inches.

	Engine			Ring Gap			Ring Side Clearance		
Year	Displacement Liters	Engine ID/VIN	Piston Clearance	Top Compression	Bottom Compression	Oil Control	Top Compression	Bottom Compression	Oil Control
2002	4.3	W	0.0007-0.0017	0.010-0.030	0.018-0.026	0.065 Max.	0.0042 Max.	0.0042 Max.	0.0020-0.0070
	4.8	V	0.0010-0.0024	0.009-0.015	0.017-0.025	0.007-0.027	0.0016-0.0033	0.0016-0.0031	0.0004-0.0087
	5.0	M	0.0007-0.0021	0.010-0.020	0.018-0.026	0.010-0.030	0.0012-0.0032	0.0012-0.0032	0.0020-0.0070
	5.3	T	0.0010-0.0024	0.009-0.015	0.017-0.025	0.007-0.027	0.0016-0.0033	0.0016-0.0031	0.0004-0.0087
	5.7	R	0.0007-0.0021	0.010-0.020	0.018-0.026	0.010-0.030	0.0012-0.0032	0.0012-0.0032	0.0020-0.0070
	6.0	U	0.0010-0.0024	0.009-0.015	0.017-0.025	0.007-0.027	0.0016-0.0033	0.0016-0.0031	0.0004-0.0087
	6.5	F	①	0.010-0.020	0.030-0.039	0.010-0.020	0.0015-0.0031	0.0015-0.0031	0.0016-0.0035
	6.6	1	0.0002-0.0007	0.012-0.018	0.020-0.026	0.006-0.014	0.0030-0.0067	0.0004-0.0012	0.0004-0.0012
	8.1	G	②	0.012-0.018	0.017-0.025	0.010-0.030	0.0012-0.0029	0.0012-0.0029	0.002-0.008
2003	4.3	X	0.0007-0.0017	0.010-0.030	0.018-0.026	0.065 Max.	0.0042 Max.	0.0042 Max.	0.0020-0.0070
	4.8	V	0.0010-0.0024	0.009-0.015	0.017-0.025	0.007-0.027	0.0016-0.0033	0.0016-0.0031	0.0004-0.0087
	5.3	T	0.0010-0.0024	0.009-0.015	0.017-0.025	0.007-0.027	0.0016-0.0033	0.0016-0.0031	0.0004-0.0087
	5.3	Z	-0.0014 0.0006	0.009-0.002	0.017-0.027	0.007-0.029	0.0016-0.0033	0.0016-0.0031	0.0005-0.0087
	6.0	U	0.0010-0.0024	0.009-0.015	0.017-0.025	0.007-0.027	0.0016-0.0033	0.0016-0.0031	0.0004-0.0087
	6.0	N	-0.0009 0.0012	0.012-0.020	0.020-0.030	0.012-0.034	0.0014-0.0031	0.0013-0.0030	0.0005-0.0008
	6.6	1	0.0002-0.0007	0.012-0.018	0.020-0.026	0.006-0.014	0.0030-0.0067	0.0004-0.0012	0.0004-0.0012
	8.1	G	②	0.012-0.018	0.017-0.025	0.010-0.030	0.0012-0.0029	0.0012-0.0029	0.002-0.008

06025-AVAL-C13

PISTON AND RING SPECIFICATIONS

All measurements are given in inches.

				Ring Gap			Ring Side Clearance		
Year	Engine Displacement Liters	Engine ID/VIN	Piston Clearance	Top Compression	Bottom Compression	Oil Control	Top Compression	Bottom Compression	Oil Control
2004	4.3	X	0.0007- 0.0017	0.010- 0.030	0.018- 0.026	0.065 Max.	0.0042 Max.	0.0042 Max.	0.0020- 0.0070
	4.8	V	0.0010- 0.0024	0.009- 0.015	0.017- 0.025	0.007- 0.027	0.0016- 0.0033	0.0016- 0.0031	0.0004- 0.0087
	5.3	T	0.0010- 0.0024	0.009- 0.015	0.017- 0.025	0.007- 0.027	0.0016- 0.0033	0.0016- 0.0031	0.0004- 0.0087
	5.3	Z	-0.0014 0.0006	0.009- 0.002	0.017- 0.027	0.007- 0.029	0.0016- 0.0033	0.0016- 0.0031	0.0005- 0.0087
	6.0	U	0.0010- 0.0024	0.009- 0.015	0.017- 0.025	0.007- 0.027	0.0016- 0.0033	0.0016- 0.0031	0.0004- 0.0087
	6.0	N	-0.0009 0.0012	0.012- 0.020	0.020- 0.030	0.012- 0.034	0.0014- 0.0031	0.0013- 0.0030	0.0005- 0.0008
	6.6	1	0.0002- 0.0007	0.012- 0.018	0.020- 0.026	0.006- 0.014	0.0030- 0.0067	0.0004- 0.0012	0.0004- 0.0012
	8.1	G	②	0.012- 0.018	0.017- 0.025	0.010- 0.030	0.0012- 0.0029	0.0012- 0.0029	0.002- 0.008
2005	4.3	X	0.0007- 0.0024	0.010- 0.020	0.015- 0.031	0.0002 0.0035	0.0012 0.0033	0.0012 0.0033	0.0030- 0.0079
	4.8	V	-0.0014 0.0006	0.0015- 0.0033	0.015- 0.0031	0.0005- 0.0078	0.0090- 0.0196	0.00173- 0.0031	0.0070- 0.0320
	5.3	B	-0.0014 0.0006	0.0090- 0.0196	0.0173- 0.030	0.007- 0.032	0.0016- 0.0033	0.0016- 0.0031	0.0005- 0.0078
	5.3	T	-0.0014 0.0006	0.0090- 0.0196	0.0173- 0.030	0.007- 0.032	0.0016- 0.0033	0.0016- 0.0031	0.0005- 0.0078
	5.3	Z	-0.0014 0.0006	0.0090- 0.0196	0.0173- 0.030	0.007- 0.032	0.0016- 0.0033	0.0016- 0.0031	0.0005- 0.0078
	6.0	N	-0.0009 0.0012	0.012- 0.020	0.020- 0.030	0.012- 0.034	0.0014- 0.0031	0.0013- 0.0030	0.0005- 0.0008
	6.0	U	-0.0009 0.0012	0.012- 0.023	0.020- 0.033	0.012- 0.037	0.0015- 0.0031	0.0015- 0.0031	0.0006- 0.0078
	6.6	2	NA	0.0118- 0.018	0.0197- 0.026	0.0059- 0.014	0.0030- 0.0067	0.0004- 0.0012	0.0004- 0.0012
	8.1	G	②	0.012- 0.018	0.017- 0.025	0.010- 0.030	0.0012- 0.0029	0.0012- 0.0029	0.002- 0.008

06025-AVAL-C14

PISTON AND RING SPECIFICATIONS

All measurements are given in inches.

				Ring Gap			Ring Side Clearance		
Year	Engine Displacement Liters	Engine ID/VIN	Piston Clearance	Top Compression	Bottom Compression	Oil Control	Top Compression	Bottom Compression	Oil Control
2006	4.3	X	0.0007-0.0024	0.010-0.020	0.015-0.031	0.0002 0.0035	0.0012 0.0033	0.0012 0.0033	0.0030-0.0079
	4.8	V	-0.0014 0.0006	0.0015-0.0033	0.015-0.0031	0.0005-0.0078	0.0090-0.0196	0.00173-0.0031	0.0070-0.0320
	5.3	B	-0.0014 0.0006	0.0090-0.0196	0.0173-0.030	0.007-0.032	0.0016-0.0033	0.0016-0.0031	0.0005-0.0078
	5.3	T	-0.0014 0.0006	0.0090-0.0196	0.0173-0.030	0.007-0.032	0.0016-0.0033	0.0016-0.0031	0.0005-0.0078
	5.3	Z	-0.0014 0.0006	0.0090-0.0196	0.0173-0.030	0.007-0.032	0.0016-0.0033	0.0016-0.0031	0.0005-0.0078
	6.0	N	-0.0009 0.0012	0.012-0.020	0.020-0.030	0.012-0.034	0.0014-0.0031	0.0013-0.0030	0.0005-0.0008
	6.0	U	-0.0009 0.0012	0.012-0.023	0.020-0.033	0.012-0.037	0.0015-0.0031	0.0015-0.0031	0.0006-0.0078
	6.6	2	NA	0.0118-0.018	0.0197-0.026	0.0059-0.014	0.0030-0.0067	0.0004-0.0012	0.0004-0.0012
	8.1	G	②	0.012-0.018	0.017-0.025	0.010-0.030	0.0012-0.0029	0.0012-0.0029	0.002-0.008

① 1-6: 0.0037-0.0047 in.
7-8: 0.0042-0.0052 in.

② Interference fit (coated piston)

06025-AVAL-C15

TORQUE SPECIFICATIONS

All readings in ft. lbs.

Year	Engine Displacement Liters	Engine ID/VIN	Cylinder Head Bolts	Main Bearing Bolts	Rod Bearing Bolts	Crankshaft Damper Bolts	Flywheel Bolts	Manifold		Spark Plugs	Oil Pan Drain Plug
								Intake *	Exhaust		
2002	4.3	W	①	77	②	70	74	③	④	11	18
	4.8	V	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.0	M	①	⑫	⑬	70	74	⑭	④	11	18
	5.3	T	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.7	R	①	⑫	⑬	70	74	⑭	④	11	18
	6.0	U	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.5	F	⑮	⑯	48	200	65	31	26	—	18
	6.6	1	⑰	⑱	⑲	278	⑳	15	25	—	62
	8.1	G	㉑	㉒	㉓	189	㉔	㉕	㉖	15	21
2003	4.3	X	①	77	②	70	74	③	④	11	18
	4.8	V	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	T	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	Z	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	U	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	N	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.6	1	⑰	⑱	⑲	278	⑳	15	25	—	62
	8.1	G	㉑	㉒	㉓	189	㉔	㉕	㉖	15	21
2004	4.3	X	①	77	②	70	74	③	④	11	18
	4.8	V	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	T	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	Z	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	U	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	N	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.6	1	⑰	⑱	⑲	278	⑳	15	25	—	62
	8.1	G	㉑	㉒	㉓	189	㉔	㉕	㉖	15	21
2005	4.3	X	①	77	②	70	74	③	④	11	18
	4.8	V	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	B	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	T	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	Z	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	U	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	N	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.6	2	⑰	⑱	⑲	②⑦	⑳	15	25	—	62
	8.1	G	㉑	㉒	㉓	189	㉔	㉕	㉖	22	21

06025-AVAL-C16

TORQUE SPECIFICATIONS

All readings in ft. lbs.

Year	Engine Displacement Liters	Engine ID/VIN	Cylinder Head Bolts	Main Bearing Bolts	Rod Bearing Bolts	Crankshaft Damper Bolts	Flywheel Bolts	Manifold		Spark Plugs	Oil Pan Drain Plug
								Intake *	Exhaust		
2006	4.3	X	①	77	②	70	74	③	④	11	18
	4.8	V	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	B	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	T	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	5.3	Z	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	U	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.0	N	⑤	⑥	⑦	⑧	⑨	⑩	⑪	11	18
	6.6	2	⑰	⑱	⑲	㉗	⑳	15	25	—	62
	8.1	G	㉑	㉒	㉓	189	㉔	㉕	㉖	22	21

* NOTE: Applies to Lower Manifold only.

① Step 1: 22 ft. lbs.
Step 2:
Short bolt: Plus 55 degrees
Medium bolt: Plus 65 degrees
Long bolt: Plus 75 degrees

② 20 ft. lbs. plus 70 degrees

③ Lower intake manifold:
Step 1: 27 in. lbs.
Step 2: 106 in. lbs.
Step 3: 11 ft. lbs.
Upper manifold bolts:
Step 1: 44 in. lbs.
Step 2: 88 in. lbs.

④ Tighten bolts to 12 ft. lbs.
Retorque to 22 ft. lbs.

⑤ 2002-04 Models: Step 1: 22 ft. lbs.
Step 2: 90 degrees
Step 3: 90 degrees,
(except front and rear medium length bolts)
Step 4: Tighten front and rear medium length bolts an additional 50 degrees
2005-06 Models: M11 bolts Step 1: 22 ft. lbs.
M11 bolts Step 2: 90 degrees
M11 bolts Step 3: 70 degrees
M8 bolts: 22 ft. lbs.

⑥ Inner bolts:
Step 1: 15 ft. lbs.
Step 2: 80 degrees
Side Bolts: 15 ft. lbs.
Outer bolts:
Step 1: 15 ft. lbs.
Step 2: 51 ft. lbs.

⑦ Step 1: 15 ft. lbs.
Step 2 (early design): 60 degrees
Step 2 (late design): 75 degrees

⑧ Installation pass: 240 ft. lbs.
Step 1: Replace bolt with new bolt
Step 2: 37 ft. lbs.
Step 3: 140 degrees

⑨ Step 1: 15 ft. lbs.
Step 2: 37 ft. lbs.
Step 3: 74 ft. lbs.

⑩ Step 1: 44 in. lbs.
Step 2: 89 in. lbs.

⑪ Step 1: 11 ft. lbs.
Step 2: 18 ft. lbs.

⑫ Two bolt bearing cap:
Step 1: 15 ft. lbs.
Step 2: 73 degrees
Four bolt bearing cap:
Step 1: 15 ft. lbs.
Step 2 (outboard bolt): 43 degrees
Step 2 (inboard bolt): 73 degrees

⑬ Step 1: 20 ft. lbs.
Step 2: 55 degrees

⑭ Step 1: 27 inch lbs.
Step 2: 106 inch lbs.
Step 3: 11 ft. lbs.

⑮ Step 1: 20 ft. lbs.
Step 2: 55 ft. lbs
Step 3: 55 ft. lbs.
Final step: 90 degrees

⑯ Inner 12mm bolts:
Step 1: 55 ft. lbs.
Step 2: 90 degrees.
Step 3: 90 degrees
Outer 12mm bolts:
Step 1: 15 ft. lbs.
Step 2: 15 ft. lbs.
Final step: 90 degrees
Outer 10mm bolts: 30 ft. lbs.

⑰ 2002-04 M8 bolts: 18 ft. lbs.
M12 bolts
Step 1: 37 ft. lbs.
Step 2: 59 ft. lbs.
Step 3: Plus 90 degrees
Step 4: Plus 75 degrees
2005-06 M12 bolts: Step 1: 37 ft.
Step 2: 59 ft. lbs.
Step 3: Plus 60 degrees
Step 4: Plus 90 degrees

⑱ 2002-04 Step 1: 72 ft. lbs.
Step 2: 97 ft. lbs.
Step 3: Plus 30 degrees
2005-06 Step 1: 74 ft. lbs.
Step 2: Plus 90 degrees

⑲ Step 1: 47 ft. lbs.
Step 2: Plus 30 degrees
Step 3: Plus 30 degrees

⑳ Step 1: 58 ft. lbs.
Step 2: Plus 60 degrees
Step 3: Plus 60 degrees

㉑ Step 1: 22 ft. lbs.
Step 2: 22 ft. lbs.,
Step 3: plus 120 degrees
Step 4:
Short bolt: Plus 60 degrees
Med. bolt: Plus 45 degrees
Long bolt: Plus 30 degrees

㉒ Inner bolts: 22 ft. lbs., plus 90 degrees
Outer studs: 22 ft. lbs., plus 80 degrees

㉓ 22 ft. lbs., plus 90 degrees

㉔ Step 1: 59 ft. lbs.
Step 2: 74 ft. lbs.

㉕ Steps 1 & 2: 44 inch lbs.
Step 3: 89 inch lbs.
Step 4: 106 inch lbs.

㉖ Center bolt: 26 ft. lbs.
Nut: 12 ft. lbs.
Stud: 15 ft. lbs.

㉗ 1st pass: 74 ft. lbs.
2nd pass: Plus 90 degrees

06025-AVAL-C17

WHEEL ALIGNMENT

			Caster		Camber		
Year	Series	Model	Range (+/-Deg.)	Preferred Setting (Deg.)	Range (+/-Deg.)	Preferred Setting (Deg.)	Toe-in (Deg.)
2002	G-Series Vans	All models	1.00	L +3.75 R +3.75	0.60	+0.50	0.24+/-0.20
	Avalanche C15 w/ 16 inch tires	2wd/4wd	1.00	L +3.90 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche C15/K15 w/ 17 inch tires	2wd/4wd	1.00	L +4.10 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche K15 w/ 16 inch tires	2wd/4wd	1.00	L +3.80 R +4.50	0.50	+0.25	0.10+/-0.20
	Avalanche C25/K25	2wd/4wd	1.00	L +4.50 R +4.75	0.50	+0.25	0.10+/-0.20
	Sierra/Silverado C15 Series Reg. & Ext. Cab	2wd/4wd	1.00	L +3.75 R +4.00	1.00	+0.25	0.10+/-0.20
	Sierra/Silverado C15 Series Crew Cab	2wd/4wd	1.00	L +4.50 R +4.75	1.00	+0.25	0.10+/-0.20
	Sierra/Silverado K15 Series Reg. & Ext. Cab	2wd/4wd	1.00	L +3.40 R +4.25	1.00	+0.25	0.10+/-0.20
	Sierra/Silverado K15 Series Crew Cab	2wd/4wd	1.00	L +4.20 R +4.75	1.00	+0.25	0.10+/-0.20
	C25 LD	2wd/4wd	1.00	L +4.50 R +4.75	1.00	+0.25	0.10+/-0.20
	C25HD/C35HD/K25 LD	2wd/4wd	1.00	L +4.25 R +4.75	1.00	+0.25	0.10+/-0.20
	K25 HD/K35HD	2wd/4wd	1.00	L +4.00 R +4.75	1.00	+0.25	0.10+/-0.20
	K35 HD	2wd/4wd	1.00	L +4.00 R +4.75	1.00	+0.25	0.10+/-0.20
2003	Express/Savana w/ 6200, 7200 & 7300 GVW	2wd/4wd	1.00	L +4.20 R +4.50	0.50	+0.15	0.10+/-0.20
	Express/Savana 8500, 8600 & 9600 GVW	2wd/4wd	1.00	L +4.60 R +5.00	0.50	+0.25	0.10+/-0.20
	Express/Savana w/10000, 11,000, 11,500,12,000 & 12,300 GVW	2wd/4wd	1.00	L +4.60 R +4.90	0.50	+0.25	0.10+/-0.20
	H 1500/2500 (RV)	2wd/4wd	1.50	L +3.60 R +4.00	0.50	+0.10	0.30+/-0.20
	H 1500/2500 (except RV)	2wd/4wd	1.00	L +3.60 R +4.00	0.75	+0.10	0.20+/-0.20
	Avalanche C15 w/ 16 inch tires	2wd/4wd	1.00	L +3.90 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche C15 w/ 17 inch tires	2wd/4wd	1.00	L +4.10 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche K15 w/ 16 inch tires	2wd/4wd	1.00	L +3.50 R +4.50	0.50	+0.25	0.10+/-0.20
	Avalanche K15 w/ 17 inch tires	2wd/4wd	1.00	L +3.80 R +4.50	0.50	+0.25	0.10+/-0.20
	Avalanche C25/K25	2wd/4wd	1.00	L +4.50 R +4.75	0.50	+0.25	0.10+/-0.20

WHEEL ALIGNMENT

			Caster		Camber		
Year	Series	Model	Range (+/-Deg.)	Preferred Setting (Deg.)	Range (+/-Deg.)	Preferred Setting (Deg.)	Toe-in (Deg.)
2003 cont.	Silverado/Sierra C15 Series Reg. & Ext. Cab	2wd/4wd	1.00	L +3.50 R +4.00	0.50	+0.25	0.10+/-0.20
	Silverado/Sierra C15 Series Crew Cab	2wd/4wd	1.00	L +4.50 R +4.75	0.50	+0.25	0.10+/-0.20
	Silverado/Sierra K15 Series Reg. & Ext. Cab ①	2wd/4wd	1.00	②	0.50	+0.25	0.10+/-0.20
	Silverado/Sierra K15 Series Crew Cab	2wd/4wd	1.00	L +4.25 R +4.75	0.50	+0.25	0.10+/-0.20
	Silverado SS	2wd/4wd	1.00	L +4.10 R +5.10	0.50	+0.10	0.10+/-0.20
	C25 LD	2wd/4wd	1.00	L +4.50 R +4.75	1.00	+0.25	0.10+/-0.20
	C25HD/C35HD/K25 LD	2wd/4wd	1.00	L +4.25 R +4.75	1.00	+0.25	0.10+/-0.20
	K25 HD	2wd/4wd	1.00	L +4.00 R +4.75	1.00	+0.25	0.10+/-0.20
	K35 HD	2wd/4wd	1.00	L +4.00 R +4.75	1.00	+0.25	0.10+/-0.20
2004	Express/Savana1500 w/ 6200, 7200 & 2500 w/ 7300 GVW	2wd/4wd	1.00	L +4.20 R +4.50	0.50	+0.15	0.10+/-0.20
	Express/Savana2500 w/ 8500, 8600 &3500 w/ 8600, 9600 GVW	2wd/4wd	1.00	L +4.60 R +5.00	0.50	+0.25	0.10+/-0.20
	Express/Savana3500 w/10000,11,000 11, 500, 12,000 & 12,300 GVW	2wd/4wd	1.00	L +4.60 R +4.90	0.50	+0.25	0.10+/-0.20
	H 1500/2500	2wd/4wd	1.00	L +4.10 R +4.50	0.50	+0.15	0.10+/-0.20
	Avalanche C15 w/ 16 inch tires	2wd/4wd	1.00	L +3.90 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche C15 w/ 17 inch tires	2wd/4wd	1.00	L +4.10 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche K15 w/ 16 inch tires	2wd/4wd	1.00	L +3.60 R +4.40	0.50	+0.25	0.10+/-0.20
	Avalanche K15 w/ 17 inch tires	2wd/4wd	1.00	L +3.80 R +4.50	0.50	+0.25	0.10+/-0.20
	Avalanche C25/K25	2wd/4wd	1.00	L +4.50 R +4.75	0.50	+0.25	0.10+/-0.20
	Silverado/Sierra C15 Series w/ Reg.Ext./Crew Cab	2wd/4wd	1.00	L +3.75 R +4.00	0.50	+0.25	0.10+/-0.20
	Silverado/Sierra K15 Series Reg./Ext./Crew Cab	2wd/4wd	1.00	L +3.60 R +4.10	0.50	+0.25	0.10+/-0.20
	Silverado SS	2wd/4wd	1.00	L +4.10 R +5.10	0.50	+0.10	0.10+/-0.20
	C25 LD	2wd/4wd	1.00	L +4.50 R +4.75	1.00	+0.25	0.10+/-0.20
	C25HD/C35/K25 LD	2wd/4wd	1.00	L +4.25 R +4.75	1.00	+0.25	0.10+/-0.20
	K25HD/K35HD	2wd/4wd	1.00	L +4.00 R +4.75	1.00	+0.25	0.10+/-0.20

06025-AVAL-C19

WHEEL ALIGNMENT

			Caster		Camber		
Year	**Series**	**Model**	**Range (+/-Deg.)**	**Preferred Setting (Deg.)**	**Range (+/-Deg.)**	**Preferred Setting (Deg.)**	**Toe-in (Deg.)**
2005-06	Express/Savana1500 w/ 6200, 7200 & 2500 w/ 7300 GVW	2wd/4wd	1.00	L +4.20 R +4.50	0.50	+0.15	0.10+/-0.20
	Express/Savana2500 w/ 8500, 8600 &3500 w/ 8600, 9600 GVW	2wd/4wd	1.00	L +4.60 R +5.00	0.50	+0.25	0.10+/-0.20
	Express/Savana3500 w/10000,11,000 11, 500, 12,000 & 12,300 GVW	2wd/4wd	1.00	L +4.60 R +4.90	0.50	+0.25	0.10+/-0.20
	H 1500/2500	2wd/4wd	1.00	L +4.10 R +4.50	0.50	+0.15	0.10+/-0.20
	Avalanche C15 w/ 16 inch tires	2wd/4wd	1.00	L +3.90 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche C15 w/ 17 inch tires	2wd/4wd	1.00	L +4.10 R +4.70	0.50	+0.25	0.10+/-0.20
	Avalanche K15 w/ 16 inch tires	2wd/4wd	1.00	L +3.60 R +4.40	0.50	+0.25	0.10+/-0.20
	Avalanche K15 w/ 17 inch tires	2wd/4wd	1.00	L +3.80 R +4.50	0.50	+0.25	0.10+/-0.20
	Avalanche C25/K25	2wd/4wd	1.00	L +4.50 R +4.75	0.50	+0.25	0.10+/-0.20
	Silverado/Sierra C15 Series w/ Reg.Ext./Crew Cab	2wd/4wd	1.00	L +3.75 R +4.00	0.50	+0.25	0.10+/-0.20
	Silverado/Sierra K15 Series Reg./Ext./Crew Cab	2wd/4wd	1.00	L +3.60 R +4.10	0.50	+0.25	0.10+/-0.20
	Silverado SS	2wd/4wd	1.00	L +4.10 R +5.10	0.50	+0.10	0.10+/-0.20
	C25 LD	2wd/4wd	1.00	L +4.50 R +4.75	1.00	+0.25	0.10+/-0.20
	C25HD/C35/K25 LD	2wd/4wd	1.00	L +4.25 R +4.75	1.00	+0.25	0.10+/-0.20
	K25HD/K35HD	2wd/4wd	1.00	L +4.00 R +4.75	1.00	+0.25	0.10+/-0.20

① Vehicles built prior to the following VINs should be serviced with OLD specifications:
Vehicles built prior to the following VINs should be serviced with NEW specifications:

Fort Wayne: 1GECK19T53Z200018 (11/14/02)
Oshawa: 2GECK19TX31211735 (11/12/02)
Pontiac: 1GECK19T63E187691 (11/14/02)

② Old specification:
L +3.50
R +4.50
New specification:
L +3.80
R +4.10

06025-AVAL-C20

TIRE, WHEEL AND BALL JOINT SPECIFICATIONS

		OEM Tires		Tire Pressures (psi)		Wheel	Ball Joint	Lug Nut
Year	Model	Standard	Optional	Front	Rear	Size	Inspection	(ft. lbs.)
2002	1500 2wd	P235/75R15	None	36	36	6-JJ	L ①	③
	1500 4wd	P245/75R16	None	36	36	7-JJ	L ①	③
	2500	LT225/75R16D	LT245/75R16C	36	36	7-JJ	L ①	③
			LT245/75R16E	36	36			
	3500 SRW	LT245/75R16E	None	36	36	7-JJ	0.125 in.②	③
	3500 DRW	LT225/75R16D	LT215/85R16D	36	36	7-JJ	0.125 in.②	③
2003-04	1500 2wd	P235/75R15	None	36	36	6-JJ	L ①	③
	1500 4wd	P245/75R16	None	36	36	7-JJ	L ①	③
	2500	LT225/75R16D	LT245/75R16C	36	36	7-JJ	L ①	③
			LT245/75R16E	36	36			
	3500 SRW	LT245/75R16E	None	36	36	7-JJ	0.125 in.②	③
	3500 DRW	LT225/75R16D	LT215/85R16D	36	36	7-JJ	0.125 in.②	③
2005-06	1500 2wd	P235/75R15	None	36	36	6-JJ	L ①	③
	1500 4wd	P245/75R16	None	36	36	7-JJ	L ①	③
	2500	LT225/75R16D	LT245/75R16C	36	36	7-JJ	L ①	③
			LT245/75R16E	36	36			
	3500 SRW	LT245/75R16E	None	36	36	7-JJ	0.125 in.②	③
	3500 DRW	LT225/75R16D	LT215/85R16D	36	36	7-JJ	0.125 in.②	③

OEM: Original Equipment Manufacturer

PSI: Pounds Per Square Inch

STD: Standard

OPT: Optional

L: Lower

U: Upper

① Do not lift truck. Inspect the boss into which the grease fitting is threaded. Replace if the boss is flush or receded below the surface of the ball joint

② Applies to both upper and lower

③ Single wheels: 140 ft. lbs.
Dual rear wheels: 175 ft. lbs.

06025-AVAL-C21

BRAKE SPECIFICATIONS

All measurements in inches unless noted

			Brake Disc			Brake Drum Diameter				Brake Caliper	
Year	Model		Original Thickness	Minimum Thickness	Maximum Runout	Original Inside Diameter	Max. Wear Limit	Max. Machine Diameter	Minimum Lining Thickness	Bracket Bolts (ft. lbs.)	Mounting Bolts (ft. lbs.)
2002	G/P1500	F	①	②	0.004	—	—	—	0.030	NA	38
		R	—	—	—	③	④	⑤	0.030	NA	—
	G/P2500	F	①	②	0.004	—	—	—	0.030	NA	38
		R	—	—	—	③	④	⑤	0.030	NA	—
	G/P3500	F	①	②	0.004	—	—	—	0.030	NA	38
		R	—	—	—	③	④	⑤	0.030	NA	—
	Avalanche	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
	Sierra	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
	Silverado	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
2003	Express	F	①	②	0.004	—	—	—	0.030	NA	38
		R	—	—	—	③	④	⑤	0.030	NA	—
	Savana	F	①	②	0.004	—	—	—	0.030	NA	38
		R	—	—	—	③	④	⑤	0.030	NA	—
	Avalanche	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
	Sierra	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
	Silverado	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
2004	Express	F	①	②	0.004	—	—	—	0.030	NA	38
		R	—	—	—	③	④	⑤	0.030	NA	—
	Savana	F	①	②	0.004	—	—	—	0.030	NA	38
		R	—	—	—	③	④	⑤	0.030	NA	—
	Avalanche	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
	Sierra	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
	Silverado	F	⑥	⑦	0.005	—	—	—	0.030	⑧	80
		R	⑨	⑩	0.005	—	—	—	0.030	⑪	⑫
2005	Express	F	⑬	⑭	0.005	—	—	—	—	⑮	⑯
		R	1.181	1.142	0.005	—	—	—	—	⑮	⑯
	Savana	F	⑬	⑭	0.005	—	—	—	—	⑮	⑯
		R	1.181	1.142	0.005	—	—	—	—	⑮	⑯
	Avalanche	F	⑬	⑭	0.005	—	—	—	—	⑮	⑯
		R	⑰	⑱	0.005	—	—	—	—	⑮	⑯
	Sierra	F	⑲	⑳	0.005	—	—	—	—	㉑	㉒
		R	㉓	㉔	0.005	—	—	—	—	㉑	㉒
	Silverado	F	⑲	⑳	0.005	—	—	—	—	㉑	㉒
		R	㉓	㉔	0.005	—	—	—	—	㉑	㉒

06025-AVAL-C22

BRAKE SPECIFICATIONS

All measurements in inches unless noted

			Brake Disc			Brake Drum Diameter				Brake Caliper	
Year	Model		Original Thickness	Minimum Thickness	Maximum Runout	Original Inside Diameter	Max. Wear Limit	Max. Machine Diameter	Minimum Lining Thickness	Bracket Bolts (ft. lbs.)	Mounting Bolts (ft. lbs.)
2006	Express	F	⑬	⑭	0.005	—	—	—	—	⑮	⑯
		R	1.181	1.142	0.005	—	—	—	—	⑮	⑯
	Savana	F	⑬	⑭	0.005	—	—	—	—	⑮	⑯
		R	1.181	1.142	0.005	—	—	—	—	⑮	⑯
	Avalanche	F	⑬	⑭	0.005	—	—	—	—	⑮	⑯
		R	⑰	⑱	0.005	—	—	—	—	⑮	⑯
	Sierra	F	⑲	⑳	0.005	—	—	—	—	㉑	㉒
		R	㉓	㉔	0.005	—	—	—	—	㉑	㉒
	Silverado	F	⑲	⑳	0.005	—	—	—	—	㉑	㉒
		R	㉓	㉔	0.005	—	—	—	—	㉑	㉒

NA: Not Available

① Available with 1.280 in. and 1.540 in. discs

② 1.2 in. disc: 1.230
1.5 in. disc: 1.480

③ Available with 1 in., 11.15 in. and 13 in. drums

④ 10 in. drum: 10.05
11.15 in. drum: 11.24
1 in. drum: 13.09

⑤ 1 in. drum: 10.09
11.15 in. drum: 11.21
1 in. drum: 13.06

⑥ Vacuum: 1.14 in.
Hydraulic: 1.50 in.

⑦ Vacuum: 1.10 in.
Hydraulic: 1.46 in.

⑧ 15 series: 129 ft. lbs.
25/35 series: 221 ft. lbs.

⑨ Vacuum: 0.787 in.
Hydraulic: 1.14 in.

⑩ Vacuum: 0.748 in.
Hydraulic: 1.10 in.

⑪ Vacuum: 148 ft. lbs.
Hydraulic (9000 lbs.): 122 ft. lbs.
Hydraulic (12,000 lbs.): 221 ft. lbs.

⑫ 15 series: 31 ft. lbs.
25/35 series: 80 ft. lbs.

⑬ Available with 1.142 in. and 1.496 in. discs

⑭ 1.14 in. disc: 1.102
1.49 in. disc: 1.457

⑮ Front 7200 GVW: 129 ft. lbs.
Front & Rear all others: 221 ft. lbs.

⑯ Front: 80 ft. lbs.
Rear: 7200 GVW: 31 ft. lbs., All others: 80 ft. lbs.

⑰ 7200 GVW: 1.181
9900 GVW: 1.142

⑱ 7200 GVW: 1.142
9900 GVW: 1.102

⑲ 6400/7000 GVW: 1.181
7200 GVW: 1.142
9900/12,300 GVW: 1.50

⑳ 6400/7000 GVW: 1.100
7200 GVW: 1.100
9900/12,300 GVW: 1.46

㉑ Light Duty: 133 ft. lbs. front, 148 ft. lbs. re
Med/heavy duty: 221 ft. lbs. front and rea

㉒ Light Duty: 74 ft. lbs. front, 31 ft. lbs. rear
Med/heavy duty: 80 ft. lbs. front and rear

㉓ 6400 GVW: 0.787
7200/12,300 GVW: 1.181
9900 GVW: 1.141

㉔ 6400 GVW: 0.784
7200/12,300 GVW: 1.142
9900 GVW: 1.102

06025-AVAL-C23

SCHEDULED MAINTENANCE INTERVALS - DIESEL ENGINES

2002-04 GENERAL MOTORS—AVALANCHE, SIERRA & SILVERADO—DIESEL

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)																					
		5	8	10	15	20	23	25	30	35	38	40	45	50	53	55	60	65	68	70	75	80	83
Air intake system	S/I			✓		✓			✓			✓		✓			✓			✓		✓	
Automatic transmission fluid ①	R	Every 50,000 miles																					
Brake system	S/I	✓	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓
Chassis & suspension grease points	L	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
Cooling fan operation	S/I			✓		✓			✓			✓		✓			✓			✓		✓	
Crankcase depression regular valve system hoses	S/I																✓						
CV-joint boots & axle seals	S/I	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
EGR system ②	S/I																✓						
Engine coolant	R	Every 150,000 miles																					
Engine cooling system hoses & radiator	S/I & C	Initially at 100,000 miles, then every 50,000 miles																					
Engine oil & filter	R	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
Front wheel bearings ③	S/I & L								✓								✓						
Fuel filter	R								✓								✓						
Rear/front axle fluid level	S/I	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	
Rotate tires	S/I	✓	✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓
Shields & underhood insulation ①	S/I			✓		✓			✓			✓		✓			✓			✓		✓	

R: Replace S/I: Inspect and service, if necessary L: Lubricate C: Clean

① Vehicles with a GVWR of 8500 lbs or more only.

② If equipped.

③ 2-wheel drive models only.

FREQUENT OPERATION MAINTENANCE (SEVERE SERVICE)

If a vehicle is operated under any of the following conditions it is considered severe service:

- **Towing a trailer or using a camper or car-top carrier.**
- **Repeated short trips of less than 5 miles in temperatures below freezing, or trips of less than 10 miles in any temperature.**
- **Extensive idling or low-speed driving for long distances as in heavy commercial use, such as delivery, taxi or police cars.**
- **Operating on rough, muddy or salt-covered roads.**
- **Operating on unpaved or dusty roads.**
- **Driving in extremely hot (over 90°) conditions.**

Engine oil & filter: replace every 2500 miles.

Chassis and suspension grease points: lubricate every 2500 miles

Rear/front axle fluid level: inspect initially at 5000 miles, then every 2500 miles thereafter.

Rotate tires: every 7500 miles.

Air cleaner filter: inspect every 15,000 miles.

Front wheel bearings (2-wheel drive only): clean, inspect and repack every 15,000 miles.

06025-AVAL-C24

SCHEDULED MAINTENANCE INTERVALS

2002-04 GENERAL MOTORS—AVALANCHE, SIERRA & SILVERADO—GASOLINE

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)														
		7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	100	150
Engine oil & filter	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Chassis lubrication	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Oil Life Monitor	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Front/Rear Axle Fluid	S/I ①	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CV joints & axle seals	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Rotate tires	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Passenger Compartment Air Filter	R		✓		✓		✓		✓		✓		✓			
Underhood Sound Shield	S/I	✓		✓		✓		✓		✓		✓		✓		
Fuel filter	R				✓				✓				✓			
Automatic transmission fluid & filter	R ②														✓	
Engine accessory drive belt	S/I								✓							
Fuel Tank, cap and lines	S/I								✓							
EGR System	S/I								✓							
EVAP System	S/I								✓							
Spark plugs	R														✓	
Spark Plug Wires	S/I														✓	
PCV Valve	S/I														✓	
Coolant	R															✓
Air cleaner filter	R				✓				✓				✓			

R: Replace S/I: Service or Inspect

① If the vehicle is used for continuous trailer towing, change the fluid in the rear axle after the first 500 miles, then, every

② Vehicles over 8,600 lbs. GVWR: every 50,000 miles

FREQUENT OPERATION MAINTENANCE (SEVERE SERVICE)

If a vehicle is operated under any of the following conditions it is considered severe service:

- **Extremely dusty areas.**
- **50% or more of the vehicle operation is in 32°C (90°F) or higher temperatures, or constant operation in temperatures below 0°C (32°F).**
- **Prolonged idling (vehicle operation in stop and go traffic.**
- **Frequent short running periods (engine does not warm to normal operating temperatures).**
- **Police, taxi, delivery usage or trailer towing usage.**

Oil & oil filter change: change every 3000 miles

Lubricate chassis every 3000 miles

Drive axle: check every 3000 miles

Rotate tires every 6000 miles

Air cleaner filter: change every 24,000 miles

06025-AVAL-C25

SCHEDULED MAINTENANCE INTERVALS

2002-04 GENERAL MOTORS—G SERIES VAN, EXPRESS & SAVANA—GASOLINE

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)															
		7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120
Accessory drive belt	S/I								✓								✓
Air cleaner filter	R				✓				✓				✓				✓
Automatic transmission fluid ①	R	Every 50,000 miles															
Chassis & suspension grease points	L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CV-joint boots & axle seals	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EGR system	S/I								✓								✓
Engine coolant	R	Every 150,000 miles															
Engine oil & filter	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EVAP system	S/I								✓								✓
Front wheel bearings	S/I & L				✓				✓				✓				✓
Fuel filter	R				✓				✓				✓				✓
Fuel system	S/I								✓								✓
PCV system	S/I	Every 100,000 miles															
Rear axle fluid level	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rotate tires	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Shields & underhood insulation ①	S/I		✓		✓		✓		✓		✓		✓		✓		✓
Spark plugs	R	Every 100,000 miles															
Spark plug wires	S/I	Every 100,000 miles															

R: Replace S/I: Inspect and service, if necessary L: Lubricate

① Vehicles with a GVWR or 8500 lbs. or more only.

FREQUENT OPERATION MAINTENANCE (SEVERE SERVICE)

If a vehicle is operated under any of the following conditions it is considered severe service:

- **Towing a trailer or using a camper or car-top carrier.**
- **Repeated short trips of less than 5 miles in temperatures below freezing, or trips of less than 10 miles in any temperature.**
- **Extensive idling or low-speed driving for long distances as in heavy commercial use, such as delivery, taxi or police cars.**
- **Operating on rough, muddy or salt-covered roads.**
- **Operating on unpaved or dusty roads.**
- **Driving in extremely hot (over 90°) conditions.**

Engine oil & filter: replace every 3000 miles or 3 months, whichever occurs first.

Chassis and suspension grease points: lubricate every 3000 miles.

Rear/front axle fluid level: inspect every 3000 miles.

Rotate the tires ever 6000 miles.

Brake system components: inspect ever 6000 miles.

Front wheel bearings (2-wheel drive only): clean, inspect and repack every 15,000 miles.

Shields & underhood insulation (vehicles w/GVWR over 8500 lbs. Only): inspect every 15,000 miles

Cooling fan system hoses & connections: inspect every 15,000 miles.

Fuel filter: replace every 30,000 miles.

Air cleaner filter: inspect every 45,000 miles.

Automatic transmission fluid & filter: replace every 50,000 miles.

Accessory drive belt: inspect every 60,000 miles.

Fuel system tank, cap and lines: inspect every 60,000 miles.

EVAP system: inspect every 60,000 miles.

EGR system: inspect every 60,000 miles.

PCV system: inspect every 100,000 miles.

Engine cooling system components: inspect and clean every 150,000 miles.

06025-AVAL-C26

SCHEDULED MAINTENANCE INTERVALS

2002-04 GENERAL MOTORS—G SERIES VAN, EXPRESS & SAVANA—DIESEL

TO BE SERVICED	TYPE OF SERVICE	VEHICLE MILEAGE INTERVAL (x1000)																							
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120
Air cleaner filter	R						✓						✓						✓						✓
Air intake system	S/I		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓
Automatic transmission fluid ①	R										✓										✓				
Chassis & suspension grease points	L	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cooling fan, ducts & hoses	S/I												✓												✓
Crankcase depression regulator valve system hoses	S/I												✓												✓
CV-joint boots & axle seals	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EGR system ②	S/I												✓												
Engine coolant	R	Every 100,000 miles																							
Engine cooling system hoses & radiator	S/I & C	Initially at 100,000 miles, then every 50,000 miles																							
Engine oil & filter ③	R	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Front wheel bearings	S/I & L						✓						✓						✓						✓
Fuel filter	R												✓												✓
Rear axle fluid level	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rotate tires	S/I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Shields & underhood insulation	S/I						✓						✓						✓						✓

R: Replace S/I: Inspect and service, if necessary L: Lubricate C: Clean

① For vehicles with a GVWR of 8500 lbs. or more.

② If equipped.

③ Perform at the mileage specified or every 3 months, whichever occurs first.

FREQUENT OPERATION MAINTENANCE (SEVERE SERVICE)

If a vehicle is operated under any of the following conditions it is considered severe service:

- **Towing a trailer or using a camper or car-top carrier.**
- **Repeated short trips of less than 5 miles in temperatures below freezing, or trips of less than 10 miles in any temperature.**
- **Extensive idling or low-speed driving for long distances as in heavy commercial use, such as delivery, taxi or police cars.**
- **Operating on rough, muddy or salt-covered roads.**
- **Operating on unpaved or dusty roads.**
- **Driving in extremely hot (over 90°) conditions.**

Engine oil & filter: replace every 2500 miles.

Chassis and suspension grease points: lubricate every 2500 miles.

Rear axle fluid level: inspect every 2500 miles.

CV-joint boots and axle seals: inspect for leakage every 2500 miles.

Rotate tires: every 7500 miles.

Air cleaner filter: inspect every 15,000 miles.

Front wheel bearings (2-wheel drive only): clean, inspect and repack every 15,000 miles.

Automatic transmission fluid & filter: replace every 50,000 miles.

06025-AVAL-C27

MAINTENANCE I AND II SERVICE SCHEDULES

2005-06 GENERAL MOTORS—AVALANCHE, EXPRESS, SAVANA, SIERRA, SILVERADO

When the CHANGE ENGINE OIL light appears, certain services and inspections are required.
Required services are described as Maintenance I and Maintenance II.
The first service on a vehicle should be Maintenance I, and the second service should be Maintenance II.
Alternate between the 2 thereafter. However, in some cases, Maintenance II may be required more often.

Maintenance I: Use Maintenance I if the CHANGE ENGINE OIL light comes on within 10 months since vehicle was purchased or, if Maintenance II was performed.

Maintenance II: Use Maintenance II if the previous service performed was Maintenance I.

Always use Maintenance II whenever the CHANGE ENGINE OIL light comes on 10 months or more since the last service, or, if the CHANGE ENGINE OIL light has not come on at all for one year.

Service	Maintenance I	Maintenance II
Change the engine oil and filter. Reset the oil life system.	✓	✓
Visually inspect the vehicle for leaks or damage. A fluid loss in the vehicle system could indicate a problem. Inspected, repair and add fluid to the system if necessary.	✓	✓
Inspect the engine air cleaner filter. If necessary, replace the filter.	✓	✓
Rotate the tires. Inspect the tire inflation pressures and the tire wear.	✓	✓
Visually inspect the brake lines and hoses for proper hook-up, binding, leaks, cracks, chafing, etc. Inspect the disc brake pads for wear and the rotors for surface condition. Inspect the drum brake linings for wear or cracks. Inspect other brake parts, including drums, wheel cylinders, calipers, parking brake, etc. Inspect the parking brake adjustment.	✓	✓
Inspect the engine coolant and the windshield washer fluid levels. Add fluid as needed.	✓	✓
Inspect the suspension and steering components. Inspect the front and rear suspension and the steering system for damaged, loose or missing parts, or signs of wear. Inspect the power steering lines and the hoses for proper hook-up, binding, leaks, cracks, chafing, etc.	--	✓
Visually inspect the coolant hoses and replace the hoses if they are cracked, swollen or deteriorated. Inspect all pipes, fittings and clamps; replace with GM parts as needed. To help ensure proper operation, a pressure test of the cooling system and pressure cap and cleaning the outside of the radiator and air conditioning condenser is recommended at least once a year.		✓
Inspect the wiper blades for wear or cracking.	--	✓
Inspect the restraint system components.Ensure the safety belt reminder light and all the belts, buckles, latch plates, retractors and anchorages are working properly. Look for any other loose or damaged safety belt system parts. If you see anything that might keep a safety belt system from working correctly, repair or replaced the damaged part. Replace torn or frayed safety belts, refer to Operational and Functional Checks in Seat Belts. Inspect for any opened or broken air bag coverings, and repair or replace as needed. The air bag system does require regular maintenance.	--	✓

06025-AVAL-C28

MAINTENANCE I AND II SERVICE SCHEDULES

2005-06 GENERAL MOTORS—AVALANCHE, EXPRESS, SAVANA, SIERRA, SILVERADO

Lubricate the body components.Lubricate all key lock cylinders, hood latch assemblies, secondary latches, pivots, spring anchor and release pawl, hood and door hinges, rear folding seats and liftgate hinges. Frequent lubrication may be required when exposed to a corrosive environment, refer to Fluid and Lubricant Recommendations . Applying dielectric silicone grease GM P/N 12345579 (Canadian P/N 1974984) or equivalent on the weatherstrips with a clean cloth.	--	✓
Inspect the transaxle fluid level and add fluid as needed.	--	✓
Inspect the suspension and steering components.Inspect the front and rear suspension and the steering system for damaged, loose or missing parts, or signs of wear. Inspect power steering lines and hoses for proper hook-up, binding, leaks, cracks, chafing, etc.	--	✓
Inspect the throttle system for interference or binding and for damaged or missing parts. Replace the parts as needed. Replace any components that have high effort or excessive wear. Do not lubricate the accelerator or the cruise control cables.	--	✓
Replace the passenger compartment air filter.	--	✓

06025-AVAL-C29

GASOLINE ENGINE REPAIR

Distributor

8.1L and 2005-06 4.8L, 5.3L and 6.0L engines use a distributorless ignition system.

REMOVAL

4.3L, 5.0L and 5.7L Engines

1. Remove or disconnect the following:
    - Negative battery cable
    - Spark plug wires and the coil leads from the distributor
    - Electrical connector at the base of the distributor
    - Distributor cap
2. Matchmark the rotor-to-housing and housing-to-engine block positions so that they can be matched during installation.
    - Distributor hold-down bolt
    - Distributor from the engine

4.8L, 5.3L and 6.0L Engines

➡If the Malfunction Indicator Lamp turns on, and a DTC code P1345 sets after installing the distributor, this indicates an incorrectly installed distributor. Engine damage or distributor damage may occur.

1. Turn **OFF** the ignition switch.
2. Remove or disconnect the following:
    - Spark plug wires from the distributor cap
    - Electrical connector from the base of the distributor
    - Two screws that hold the distributor cap to the housing. Discard the screws.
    - Distributor cap from the housing
3. Use a grease pencil in order to note the position of the rotor in relation to the distributor housing.
4. Mark the distributor housing and the intake manifold with a grease pencil.
5. Remove or disconnect the following:
    - Mounting clamp hold-down bolt
    - Distributor
6. As the distributor is being removed from the engine, watch the rotor move in a counterclockwise direction about 42 degrees. This will appear as slightly more than the 1 o'clock position. Note the position of the rotor segment. Place a second mark on the base of the distributor. This will aid in achieving proper rotor alignment during the distributor installation.

INSTALLATION

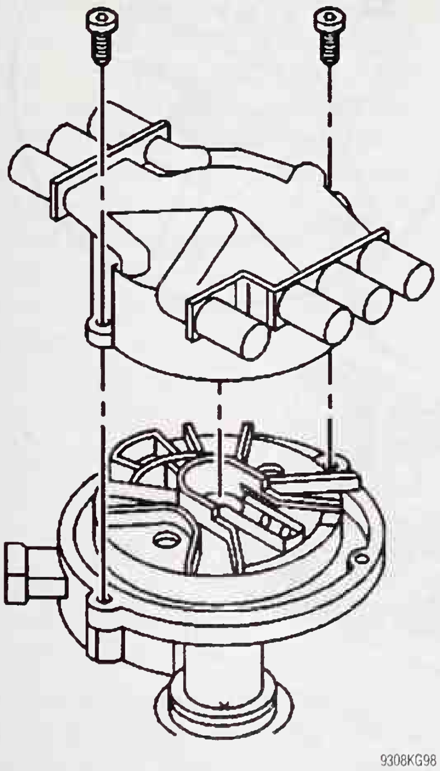
4.3L, 5.0L and 5.7L Engines

TIMING NOT DISTURBED

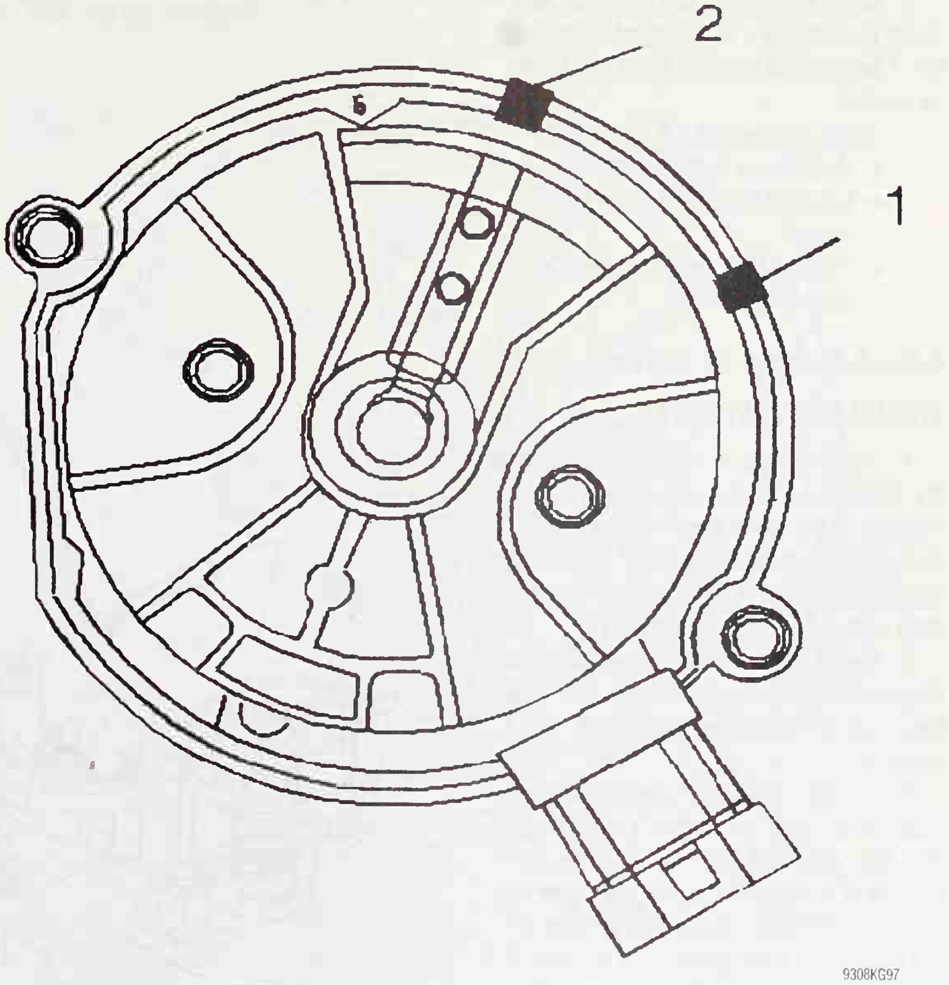
1. Install or connect the following:
    - Distributor, aligning the matchmarks are properly alignment
    - Distributor hold-down bolt
    - Distributor cap
    - Electrical connector at the base of the distributor
    - Spark plug wires and coil leads
    - Negative battery cable

TIMING DISTURBED

1. Remove the No. 1 cylinder spark plug. Turn the engine using a socket wrench on the large bolt on the front of the crankshaft pulley. Place a finger near the No. 1 spark plug hole and turn the crankshaft until the piston reaches Top Dead Center (TDC). As the engine approaches TDC, you will feel air being expelled through the No. 1 cylinder spark plug hole. The timing mark on the crankshaft pulley should now be aligned



Distributor cap—4.3L, 4.8L, 5.3L and 6.0L engines



Distributor rotor starting point (1) and 42 degrees counterclockwise (2)—4.8L, 5.3L and 6.0L engines with the 0 mark on the timing scale. If the position is not being met, turn the engine another full turn (360 degrees). Once the engines position is correct, install the spark plug.

➡Before installation, position the rotor so it points to the No. 2 terminal on the cap. As the distributor is lowered into the engine, the rotor will rotate clockwise and stop at the No. 1 terminal. This is the desired position.

2. Turn the rotor so that it will point to the No. 1 terminal of the distributor cap when it is fully seated in the engine.
3. Install or connect the following:
    - Distributor. It may be necessary to turn the rotor a little in either direction, in order to engage the gears.

➡If the distributor will not seat completely in the engine, remove the distributor and align the groove on the top of the oil pump drive shaft with a long screwdriver to match the tab on the bottom of the distributor shaft. Reinstall the distributor.

4. Tap the starter a few times to ensure that the oil pump shaft is mated to the distributor shaft.
5. Bring the engine to TDC again and check that the rotor is pointed toward the No. 1 terminal of the cap. If the marks are all aligned.
6. Install or connect the following:
    - Hold-down bolt and tighten
    - Cap and fasten the mounting screws
    - Electrical connections and the spark plug wires

4.8L, 5.3L and 6.0L Engines

TIMING NOT DISTURBED

1. If installing a new distributor assembly, place two marks on the new distributor housing in the same location as the two marks on the original housing. Remove the new distributor cap, if necessary. Align the rotor with mark made at location 2.
2. Guide the distributor into the engine. Align the hole in the distributor hold-down base over the mounting hole in the intake manifold.
3. As the distributor is being installed, observe the rotor moving in a clockwise direction about 42 degrees. Once the distributor is completely seated, the rotor segment should be aligned with the mark on the distributor base in location number 1. If the rotor segment is not aligned with the number 1 mark, the driven gear teeth and the camshaft have meshed one or more teeth out of alignment.
4. Install or connect:
    - Distributor mounting clamp bolt and tighten to 18 ft. lbs. (25 Nm)
5. Distributor cap with NEW distributor cap screws. Tighten to 21 inch lbs. (2.4 Nm).
    - Electrical connector
    - Spark plug wires
    - Ignition coil wire

➡If the Malfunction Indicator lamp is turned on after installing the distributor, and a DTC P1345 is found, the distributor has been installed incorrectly.

TIMING DISTURBED

1. Rotate the number 1 cylinder to TDC of the compression stroke. The engine front cover has 2 alignment tabs and the crankshaft balancer has 2 alignment marks (spaced 90 degrees apart) which are used for positioning number 1 piston at top dead center (TDC). With the piston on the compression stroke and at top dead center, the crankshaft balancer alignment mark must align with the engine front cover tab and the crankshaft balancer alignment mark must align with the engine front cover tab.
2. Align the white paint mark on the bottom stem of the distributor with the predrilled indent hole in the bottom of the gear. If the driven gear is installed incorrectly, the dimple will be approximately 180 degrees opposite of the rotor segment when it is installed in the distributor.

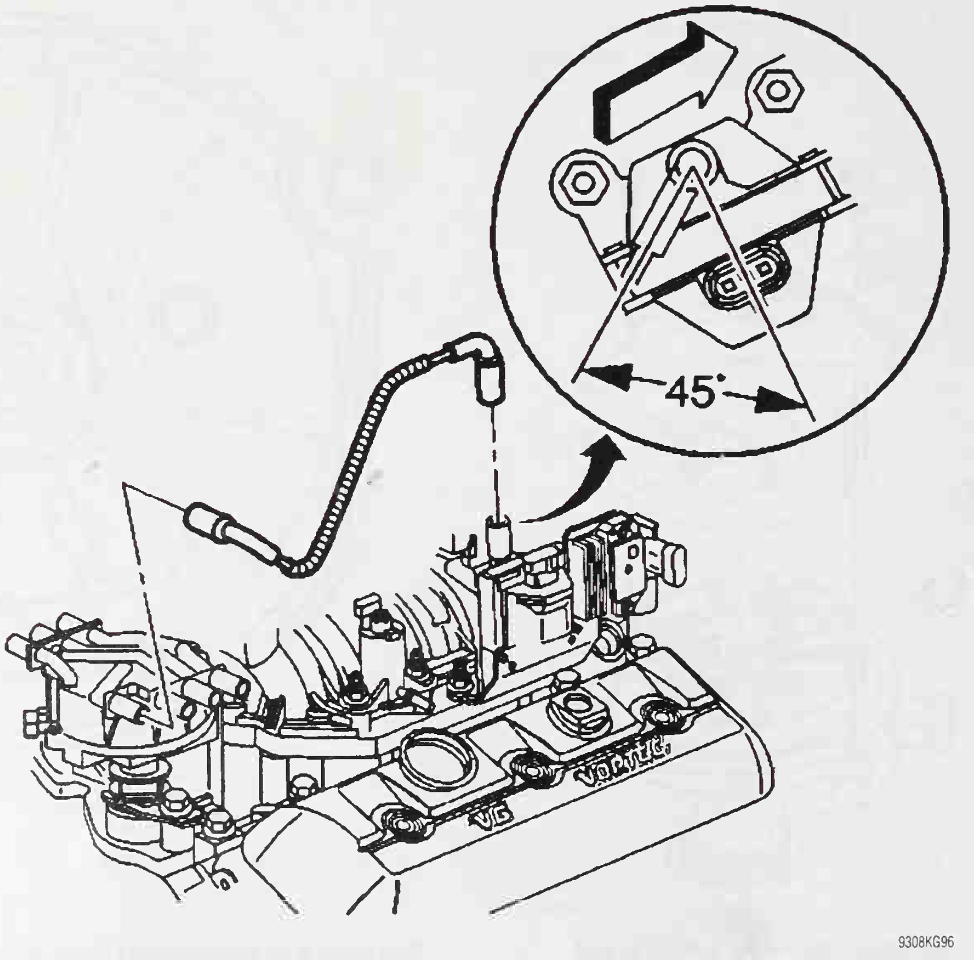
The OBD II ignition system distributor driven gear and rotor may be installed in multiple positions. In order to avoid mistakes, mark the distributor on the following components in order to ensure the same mounting position upon reassembly:

- The distributor driven gear
- The distributor shaft
- The rotor holes

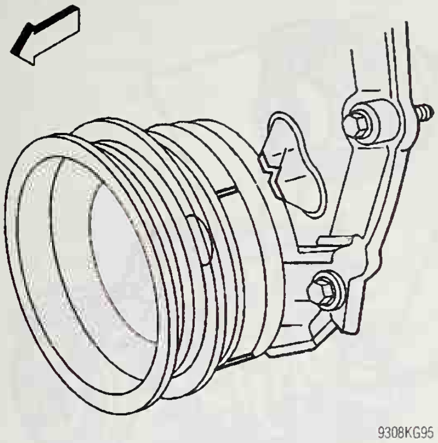
Installing the driven gear 180 degrees out of alignment, or locating the rotor in the wrong holes, will cause a no-start condition. Premature engine wear or damage may result.

3. Using a long screwdriver, align the oil pump drive shaft to the drive tab of the distributor. Guide the distributor into the engine. Ensure that the spark plug towers are perpendicular to the centerline of the engine.

Once the distributor is fully seated, the rotor segment should be aligned with the pointer cast into the distributor base.



Distributor electrical connection—4.8L, 5.3L and 6.0L engines



Engine at TDC compression—4.8L, 5.3L and 6.0L engines

This pointer may have a 6 cast into it, indicating that the distributor is to be used on a 6 cylinder engine or a 8 cast into it, indicating that the distributor is to be used on a 8 cylinder engine.

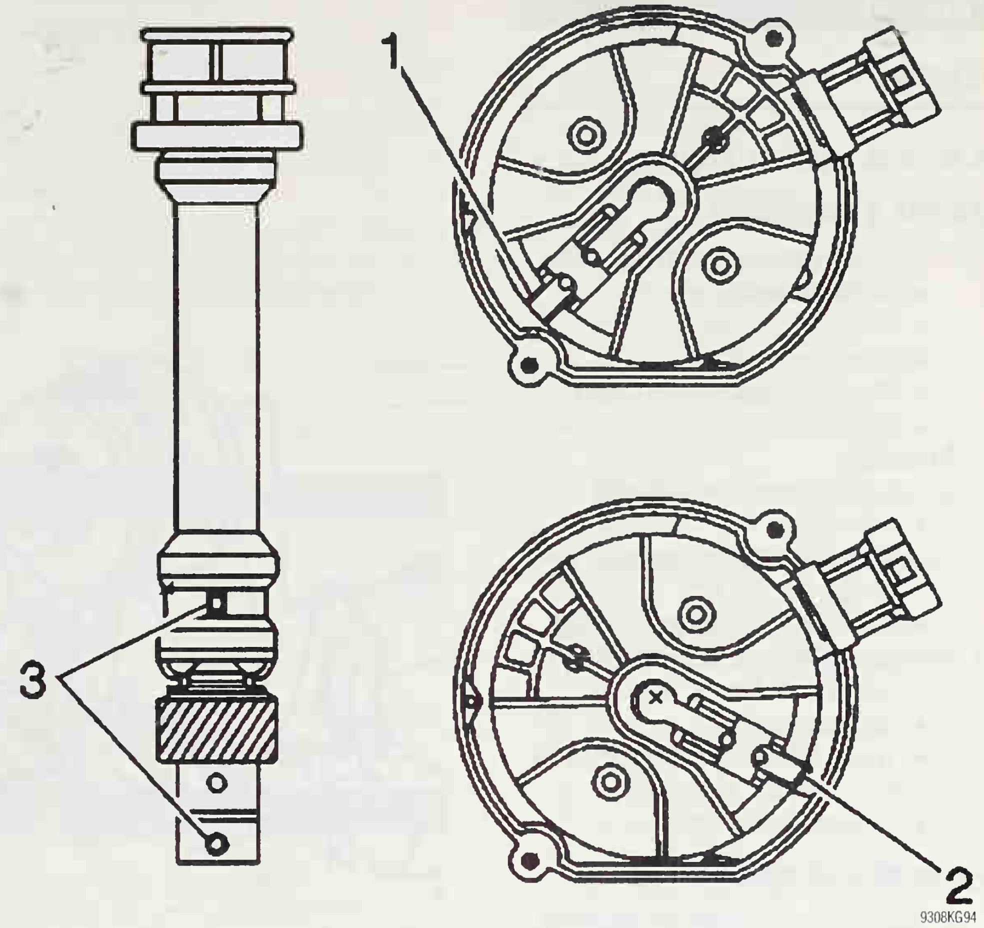
If the rotor segment does not come within a few degrees of the pointer, the gear mesh between the distributor and the camshaft may be off a tooth or more.

If this is the case, repeat the procedure again in order to achieve proper alignment.

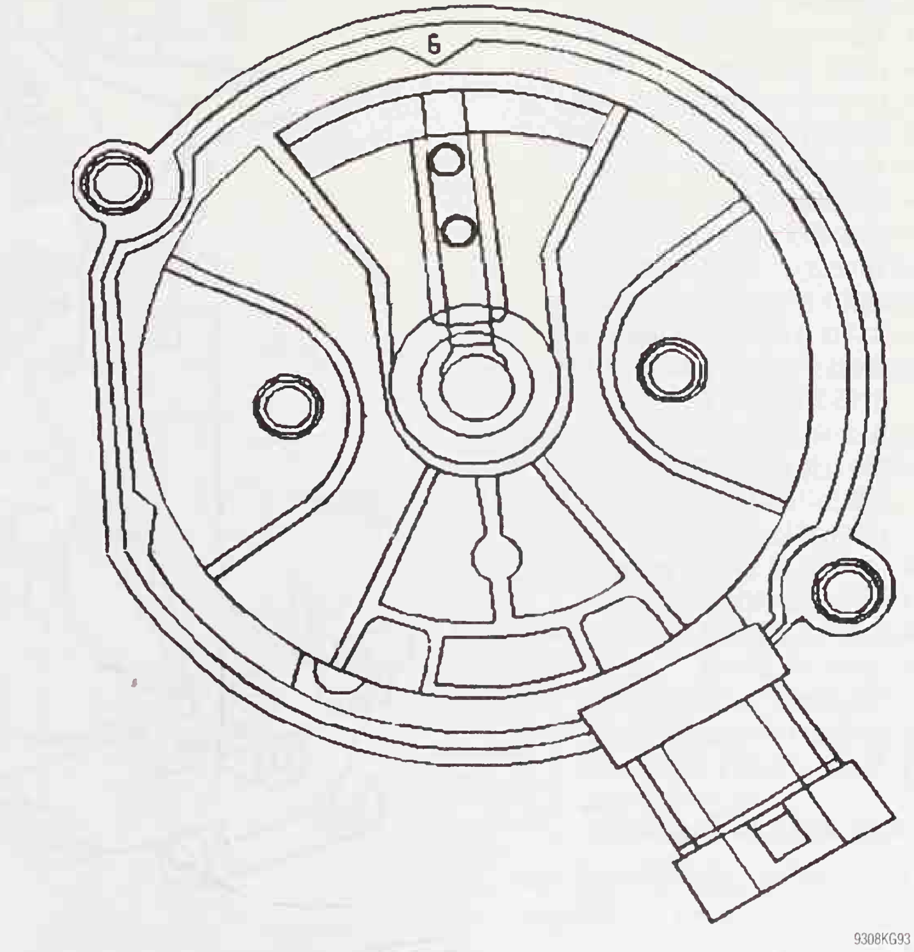
➡Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

4. Install or connect the following:
   - Distributor mounting clamp bolt and tighten to 18 ft. lbs. (25 Nm)
   - Distributor cap with NEW distributor cap screws. Tighten to 21 inch lbs. (2.4 Nm).
   - Electrical connector
   - Spark plug wires
   - Ignition coil wire.

➡If the Malfunction Indicator lamp is turned on after installing the distributor, and a DTC P1345 is found, the distributor has been installed incorrectly.



Distributor alignment. 1 is the starting point; 2 is installed; 3 are the shaft alignment marks—4.8L, 5.3L and 6.0L engines



Distributor fully seated–4.8L, 5.3L and 6.0L

Alternator

REMOVAL

4.3L, 5.0L and 5.7L Engines

SIERRA & SILVERADO

1. Remove or disconnect the following:
   - Negative battery cable
   - Wires
   - Accessory belt(s)
   - Mounting bracket, if necessary
   - Alternator

To install:

2. Install or connect the following:
   - Alternator
   - Mounting bracket. Torque the bolts to 18 ft lbs. (25 Nm).
   - Mounting bolts. Torque the right bolt to 18 ft lbs. (25 Nm) and left bolt to 37 ft lbs. (50 Nm).
   - Accessory belt(s)
   - Wires. Torque the battery feed wire to 71 inch lbs. (8 Nm).
   - Negative battery cable

EXPRESS AND SAVANA

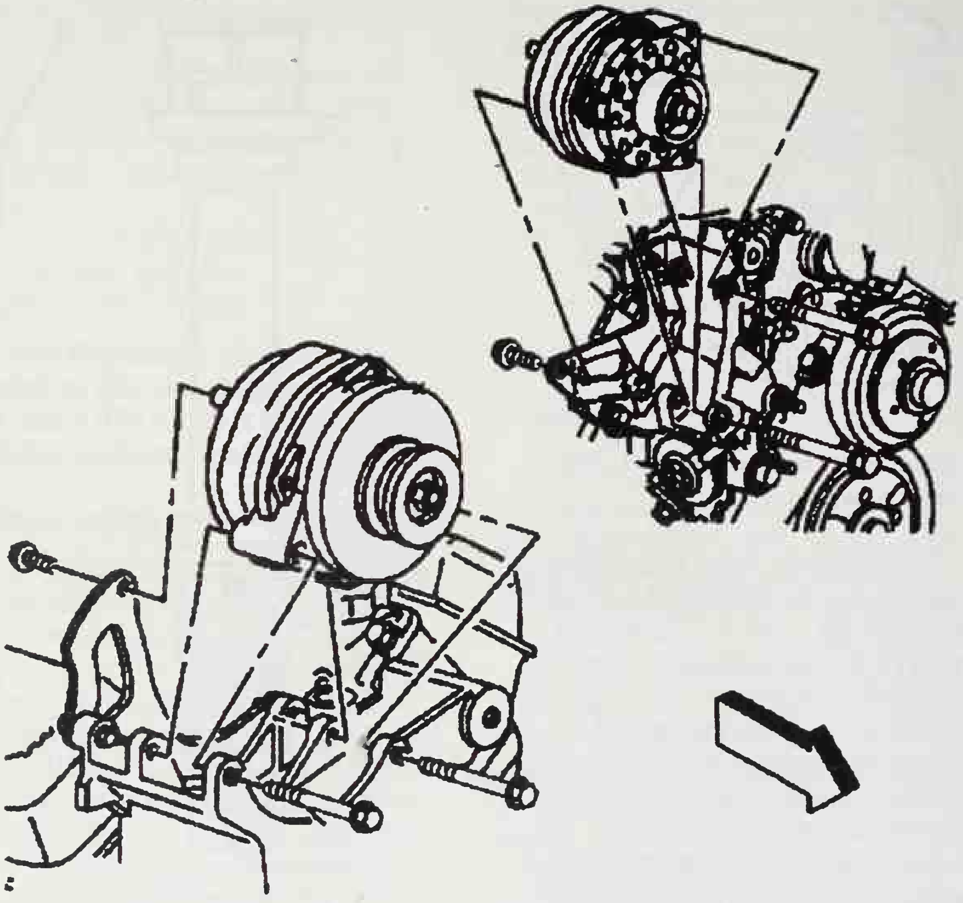
1. Remove or disconnect the following:
   - Negative battery cable
   - Coolant reservoir
   - Air cleaner
   - Upper fan shroud
   - Accessory belt(s)
   - Heater hose pipe
   - Oil fill tube from bracket
   - Support bracket
   - Mounting bracket
   - Mounting bolts
   - Alternator
   - Wires

To install:

2. Install or connect the following:
   - Wires. Torque the battery feed wire to 15 ft lbs. (20 Nm).
   - Alternator
   - Mounting bolts. Torque the front bolt to 37 ft lbs. (50 Nm) and the rear bolt to 18 ft lbs. (25 Nm).
   - Oil fill tube support bracket
   - Oil fill tube to bracket
   - Accessory belt(s)
   - Upper fan shroud
   - Air cleaner
   - Coolant reservoir
   - Negative battery cable

4.8L, 5.3L and 6.0L Engines

1. Disconnect the negative battery cable.
2. Remove or disconnect the following:
   - Accessory drive belt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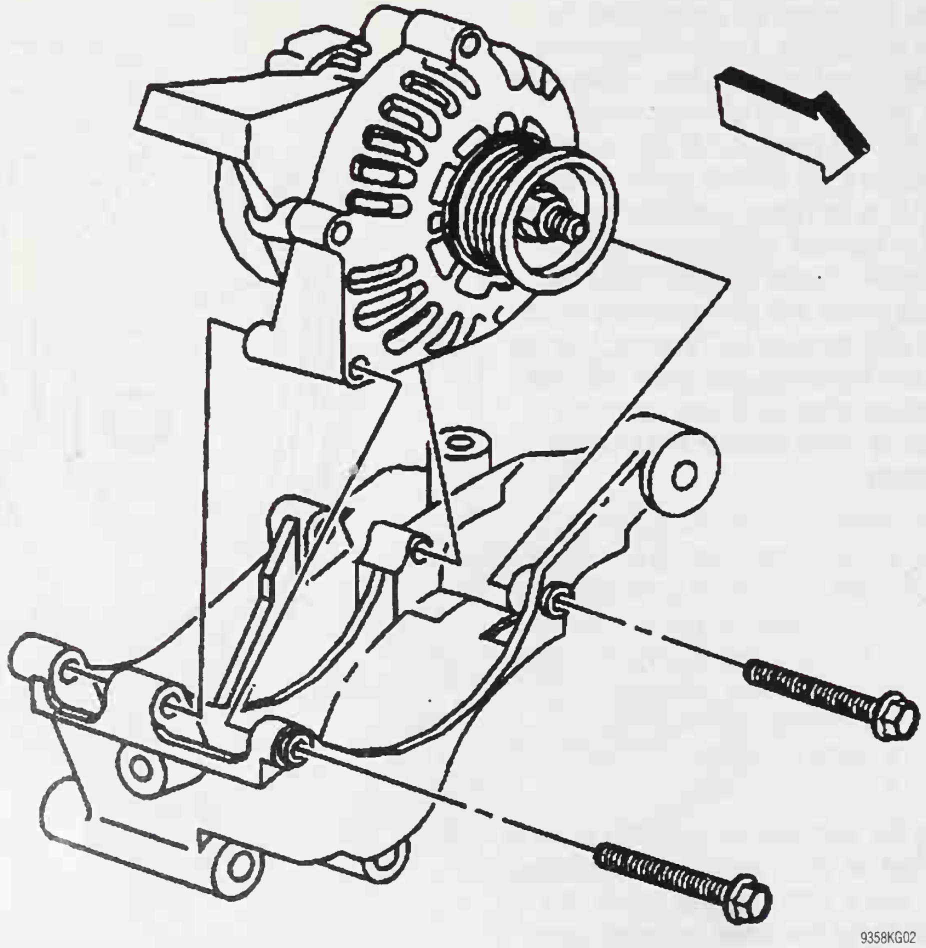
Exploded view of the alternator mounting—Truck shown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Exploded view of the alternator mounting—Van shown

- Engine sight shield, if necessary
- Electrical connections from the generator
- Mounting bolts
- Generator

To install:

3. Install the generator.
4. Install or connect the following:
   - Generator mounting bolts. Tighten the bolts to 37 ft. lbs. (50 Nm).
   - Electrical connections to the generator. Tighten the B+ nut to 13 ft. lbs. (18 Nm).
   - Engine sight shield, if removed
   - Accessory drive belt

5. Connect the negative battery cable. Tighten to bolt to 13 ft. lbs. (17 Nm).

8.1L Engine

1. Disconnect the negative battery cable.
2. Remove or disconnect the following:
   - Electrical connections from the generator

3. Remove the cable from the generator as follows:

   a. Slide the boot down, to reveal the terminal stud.

   b. Unfasten the cable nut from the stud, then remove the generator cable.
   - Accessory drive belt
   - Mounting bolts
   - Generator
   - Mounting bolts securing the generator to the brace and bracket
   - Generator

To install:

4. Install or connect the following:
   - Generator
   - Generator mounting bolts. Tighten the bolts to 37 ft. lbs. (50 Nm).
   - Accessory drive belt

5. Connect the generator cable, secure with the nut and tighten to 80 inch lbs. (9 Nm). Slide the boot back over the terminal stud.
   - Electrical connections to the generator

6. Connect the negative battery cable.

Ignition Timing

ADJUSTMENT

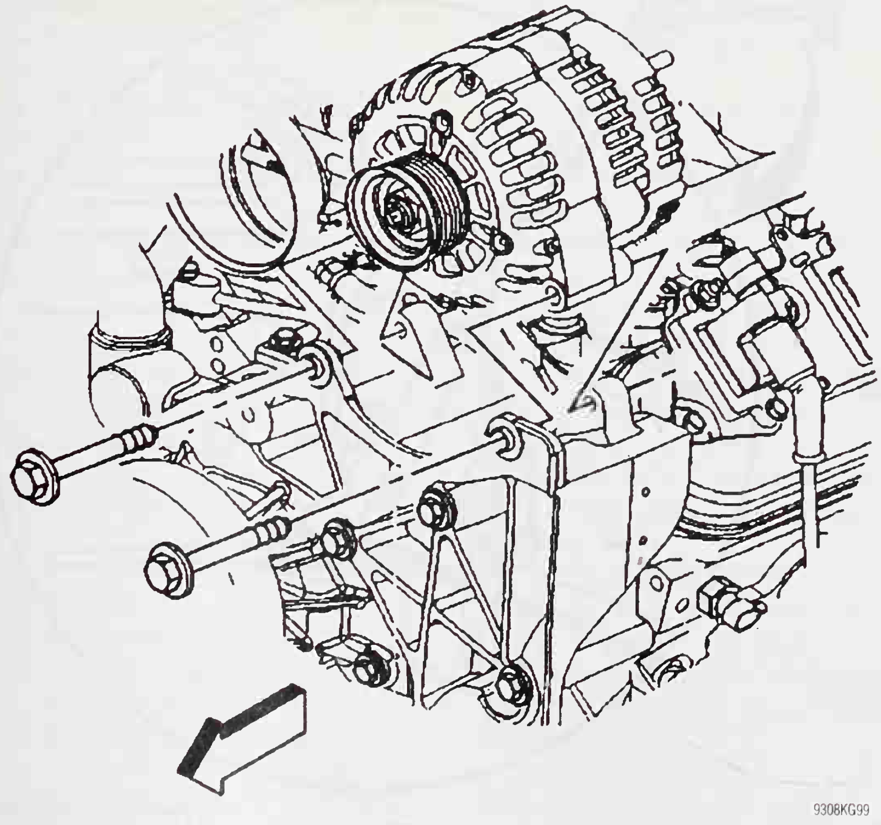
Always refer to the Vehicle Emissions Control Information label in the engine compartment for base ignition timing specification and adjustment procedures.

Engine Assembly

REMOVAL & INSTALLATION

4.3L (Exc. Silverado and Sierra), 5.0L and 5.7L Engines

1. Drain the cooling system.
2. Drain the engine oil.



Alternator mounting—4.8L, 5.3L & 6.0L engines; 8.1L similar

3. Remove or disconnect the following:
   - Negative battery cable
   - Hood
   - Air cleaner
   - Accessory drive belt
   - Fan
   - Water pump pulley
   - Radiator and shroud
   - Heater hoses at the engine
   - Accelerator, cruise control and detent linkage if used
   - Air conditioning compressor, if used, and lay aside
   - Power steering pump, if used, and lay aside
   - Wiring from the engine
   - Fuel line
   - Vacuum lines from the intake manifold
   - Exhaust pipes from the manifold
   - Strut rods at the engine mountings, if used
   - Flywheel or torque converter cover
   - Wiring along the oil pan rail
   - Starter
   - Wire for the fuel gauge
   - Converter-to-flex plate bolts, if equipped with automatic transmission

4. Support the transmission
   - Bell housing to engine bolts
   - Rear engine mounting to frame bolts and the front through bolts and the engine

To install:

5. Lower the engine.
6. Install or connect the following:
   - Engine mounting bolts. Torque the rear engine mounting to frame bolts or nuts to 45 ft. lbs. (54 Nm), the front through-bolts to 70 ft. lbs. (97 Nm) and the front nuts to 50 ft. lbs. (67 Nm).
   - Bell housing to engine bolts and torque to 35 ft. lbs. (47 Nm)

7. Remove the transmission support.
   - Converter-to-flex plate bolts and tighten to 35 ft. lbs. (47 Nm)
   - Fuel gauge wiring
   - Starter
   - Flywheel or torque converter cover
   - Strut rods at the engine mountings, if used
   - Exhaust pipes at the manifold
   - Vacuum lines to the intake manifold
   - Fuel line
   - Engine wiring harness
   - Power steering pump, if used
   - Air conditioning compressor, if used
   - Accelerator, cruise control and detent linkage

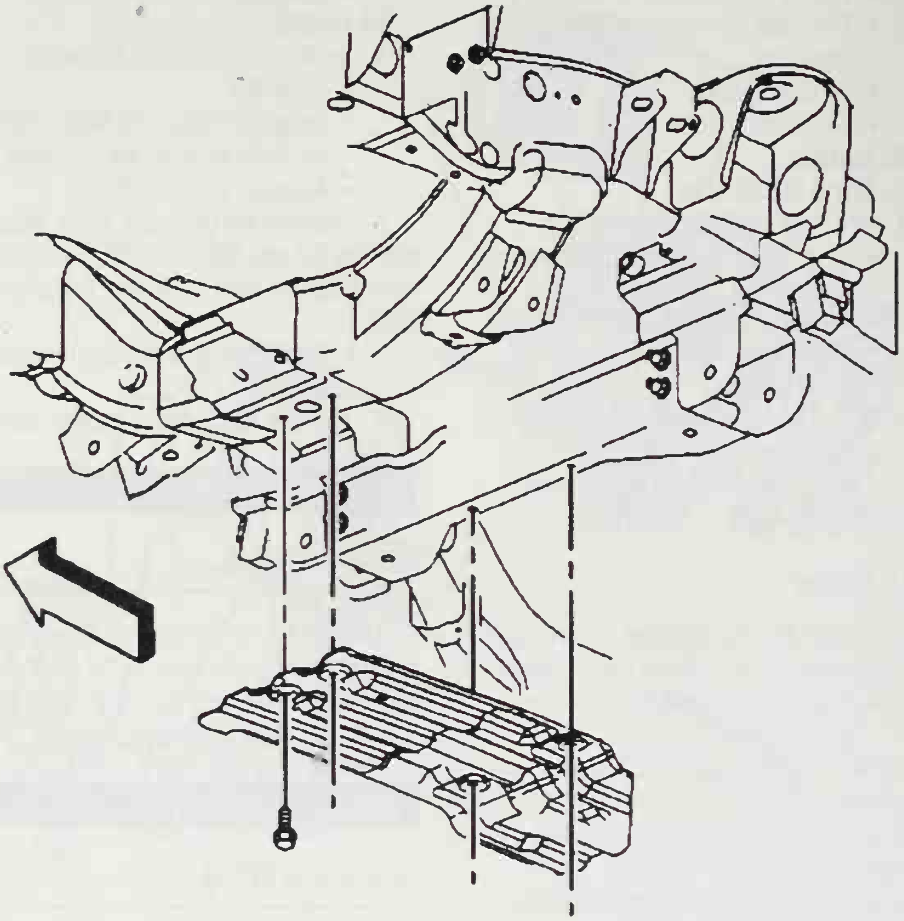
  - Heater hoses
  - Radiator and shroud
  - Accessory drive belts
  - Hood
  - Negative battery cable
8. Refill coolant and engine oil.

4.3L Silverado and Sierra

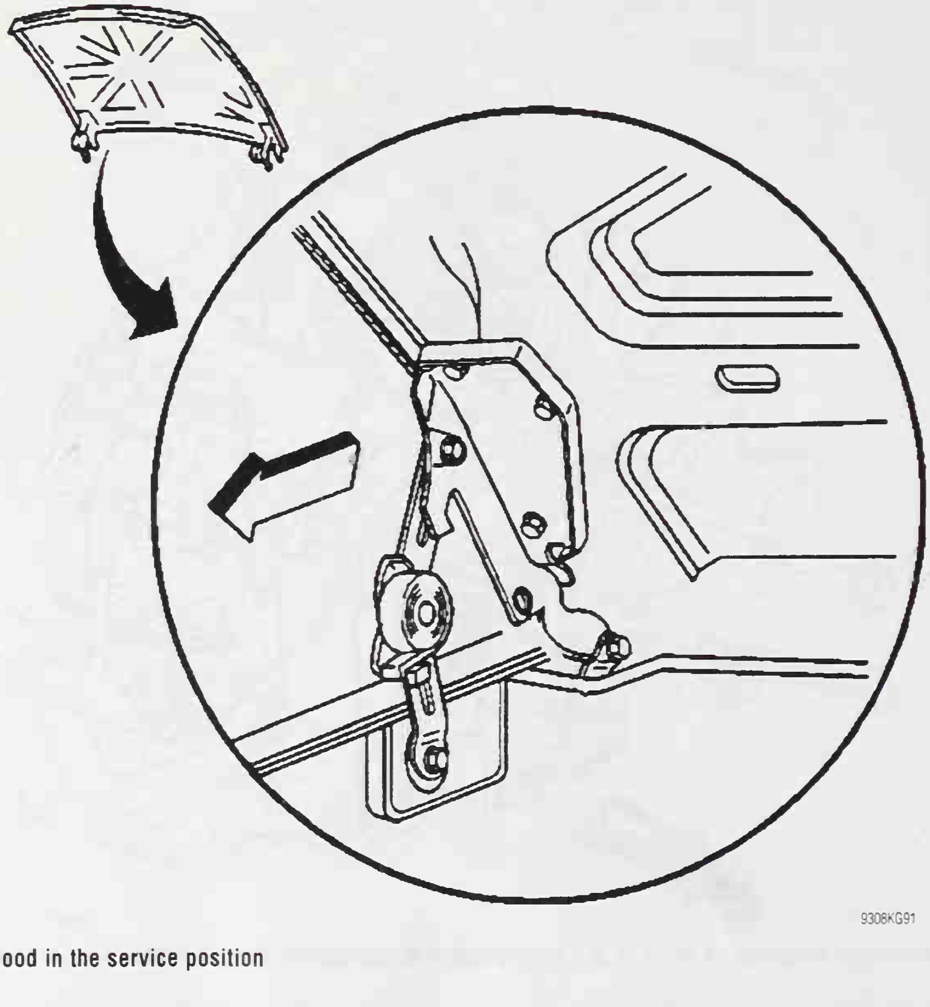
1. Remove or disconnect the following:
    - Battery negative cable
    - Coolant
    - A/C refrigerant, if equipped
    - Oil pan skid plate
    - Engine shield
    - Starter.
    - Transmission cover
    - Bolt holding the bracket for the starter cables and transmission cooler lines, if equipped
    - Nuts at the catalytic converter pipe
    - Exhaust pipes from the exhaust manifolds
    - Bolts holding the brackets to the oil pan for both battery cables
    - Crankshaft Position (CKP) sensor electrical connector and remove the harness from the retainer
    - Low oil level sensor electrical connector and remove the wire harness from the retainer
    - Bolt holding the battery negative cable and ground cable to the engine
    - Torque converter-to-flywheel bolts, if equipped, through the starter opening
    - Engine to transmission bolts
2. Move the hood hinge bolts to hold the hood in the service position.
3. Remove or disconnect the following:
    - Positive Crankcase Ventilation (PCV) hose from the air cleaner outlet duct
    - Air cleaner outlet duct from the throttle body and the air cleaner assembly
    - Fan shroud
    - Drive belt
    - Engine cooling fan
    - Radiator inlet and outlet hoses from the engine

CAUTION

In order to avoid possible injury or vehicle damage, always replace the accelerator control cable with a NEW cable whenever you remove the engine from the vehicle.



Engine shield removal



Hood in the service position

⁂ WARNING

In order to avoid cruise control cable damage, position the cable out of the way while you remove or install the engine.

- Accelerator control cable
- Cruise control cable from the throttle body and the bracket on the throttle body and intake manifold, if equipped
- Engine wiring harness and clip from the accelerator control cable bracket
- Accelerator control cable bracket from the throttle body
- A/C hoses from the compressor and the accumulator, if equipped
- Secondary Air Injection (AIR) crossover pipe from the AIR pipe assemblies

➡Remove the AIR pipes before engine removal. The AIR pipes can break or damage easily causing erratic engine operation.

- AIR pipe assemblies from the left exhaust manifold, if equipped
- AIR pipe assembly from the AIR pump
- AIR pipe assembly from the right exhaust manifold, if equipped.
- A/C pressure switch, if equipped
- A/C compressor clutch, if equipped
- Exhaust Gas Recirculation (EGR) valve
- Battery positive cable
- Fuel meter body
- Idle Air Control (IAC) motor
- Throttle Position (TP) sensor
- Engine Coolant Temperature (ECT) sensor
- EVAP canister purge solenoid valve
- Manifold Absolute Pressure (MAP) sensor
- Ignition Control Module (ICM)
- Ignition coil
- Engine oil pressure gauge sensor
- Distributor
- Knock Sensor (KS)
- Nuts holding the bracket for the engine wiring harness to the intake manifold studs
- Bolt holding the engine wiring harness clip to the battery positive cable junction block bracket
- Bracket for the battery positive cable junction block from the power steering pump mounting bracket
- Battery positive and negative cables, if not done already
- Nut holding the ground wire to the stud at the rear of the right cylinder head
- Stud holding the engine wiring harness bracket to the rear of the right cylinder head
- Nut holding the engine wiring harness bracket to the stud for the EVAP canister purge solenoid valve
- Bolt holding the ground strap and the ground wire to the rear of the left cylinder head. Move the engine wiring harness aside.
- Both heater hoses from the engine and the cowl
- Distributor cap
- Fuel pipes at the rear of the engine
- Hose from the EVAP purge canister solenoid valve
- Power brake booster vacuum hose
- Nuts holding the power steering pump rear bracket to the side and front of the engine
- Three bolts and the nut holding the power steering pump mounting bracket to the engine

4. With the power steering pump and the A/C compressor still attached, slide the power steering pump mount bracket off the stud and set aside.

- Water outlet
- EGR valve inlet pipe from the intake and exhaust manifold

5. Attach the engine crane to the left front and right rear intake manifold mounting bolts.

6. Remove the engine motor mount to frame bracket bolts.

7. Support the transmission with a suitable jack.

8. Remove the engine.

To install:

9. Install or connect the following:

- Engine in the vehicle
- Engine mount to frame bracket bolts. Tighten the bolts to 50 ft. lbs. (65 Nm).

10. Remove the lifting device.

11. Apply thread lock GM P/N 12345382 or equivalent to the threads of the lower intake manifold bolts. Install the bolts and tighten as follows:

a. 1st pass: 27 inch lbs. (3 Nm)
b. 2nd pass: 106 inch lbs. (12 Nm)
c. Final pass: 11 ft. lbs. (15 Nm)

12. Loosely install one transmission to engine bolt. Remove the support jack from under the transmission.

13. Install the EGR valve inlet pipe to the intake and the exhaust manifold and tighten as follows:

a. Tighten the EGR valve inlet pipe intake nut to 18 ft. lbs. (25 Nm).
b. Tighten the EGR valve inlet pipe exhaust nut to 22 ft. lbs. (30 Nm).
c. Tighten the EGR valve inlet pipe clamp bolt to 18 ft. lbs. (25 Nm).

14. Install the water outlet.

15. Slide the power steering pump mounting bracket with the power steering pump and the A/C compressor on the stud.

16. Position the power steering pump rear bracket on the studs.

17. Install or connect the following:

- Power steering pump mounting bracket bolts and the nut
- Nut for the power steering pump rear bracket to the front of the engine. Tighten the power steering pump mounting bracket and the power steering pump rear bracket bolts and the nuts to 30 ft. lbs. (41 Nm).
- Fuel pipes
- Hose to the EVAP purge canister solenoid valve
- Vacuum brake booster hose to engine and the vacuum brake booster
- Distributor cap
- Both heater hoses to the engine and the cowl
- AIR pipe assembly with new gaskets to the right exhaust manifold, if equipped
- AIR pipe nuts and bracket bolt. Tighten the nuts to 18 ft. lbs. (25 Nm) and the bolt to 89 inch lbs. (10 Nm).
- AIR pipe assembly to the AIR pump
- AIR pipe assembly with new gaskets to the left exhaust manifold, if equipped. Install the AIR pipe nuts and bracket bolt. Tighten the to 18 ft. lbs. (25 Nm) and the bolt to 89 inch lbs. (10 Nm).
- AIR crossover pipe to the AIR pipe assemblies
- Engine wiring harness
- A/C pressure switch
- A/C compressor clutch
- EGR valve
- Generator battery positive cable
- Fuel meter body assembly
- IAC motor
- TP sensor
- ECT sensor
- EVAP canister purge solenoid valve
- MAP sensor
- ICM
- Ignition coil
- Engine oil pressure gauge sensor

- Distributor
- KS

18. Install the bolt holding the ground strap and the ground wire to the rear of the left cylinder head. Tighten the ground strap and ground wire bolt to 12 ft. lbs. (16 Nm).
19. Position the engine wiring harness bracket on the EVAP purge canister solenoid valve stud and install the nut.
20. Install the stud holding the wire harness bracket to the rear of the right cylinder head. Tighten the nut on the EVAP solenoid to 80 inch lbs. (9 Nm). Tighten the stud at rear of the cylinder head to 18 ft. lbs. (25 Nm).
21. Install the nut holding the ground wire on the stud at the rear of the right cylinder head. Tighten the ground wire nut to 12 ft. lbs. (16 Nm).
22. Position the battery positive and negative cables. Do not connect the negative battery cable to the battery.
23. Install or connect the following:
    - Battery positive cable junction block bracket and bolt to the power steering pump mounting bracket. Tighten the bolt to 18 ft. lbs. (25 Nm).
    - Bolt holding the engine wiring harness bracket to battery positive cable junction block bracket
    - Engine wiring harness bracket on the intake manifold studs. Tighten the nuts to 106 inch lbs. (12 Nm) and the bolt to 80 inch lbs. (9 Nm).
    - A/C hoses
    - Accelerator control cable bracket. Tighten the nuts to 80 inch lbs. (9 Nm).
    - Engine wire harness and clip to the accelerator control cable bracket

⁂ CAUTION

In order to avoid possible injury or vehicle damage, always replace the accelerator control cable with a NEW cable whenever you remove the engine from the vehicle.

- NEW accelerator control cable
- Cruise control cable
- Radiator inlet and outlet hoses
- Engine cooling fan
- Drive belt
- Upper and lower radiator shroud
- Air cleaner outlet duct to the throttle body and the air cleaner assembly
- PCV hose to the air inlet duct

24. Move the hood hinge bolts from the service position to the normal operating position.
25. Raise the vehicle.
26. Install or connect the following:
    - Remaining transmission to engine bolts except for the one where the transmission cover mounts
    - Torque converter to flywheel
    - Transmission cover and bolts. Tighten the transmission cover to oil pan bolt to 106 inch lbs. (12 Nm). Tighten the transmission cover to transmission bolt to 34 ft. lbs. (47 Nm).
    - Bolt holding the bracket for the starter cables and the transmission cooler pipe and tighten to 80 inch lbs. (9 Nm)
    - Positive and negative battery cable brackets-to-oil pan bolts and tighten to 106 inch lbs. (12 Nm).
    - Bolt for the battery negative cable and ground wire to the front of the engine. Tighten the battery negative cable and ground wire bolt to 18 ft. lbs. (25 Nm).
    - CKP sensor and install the harness in the retainer
    - Low oil level sensor and install the wire harness in the retainer
    - Exhaust pipe to the exhaust manifolds and tighten the nuts at the catalytic converter flange
    - Starter motor
    - Oil pan skid plate and tighten bolt to 15 ft. lbs. (20 Nm)
    - Engine shield
27. Lower the vehicle.
    - Battery negative cable
    - Engine oil
    - Coolant
28. Recharge the A/C system.

4.8L, 5.3L and 6.0L Engines

⁂ CAUTION

Before servicing any electrical component, the ignition key must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures.

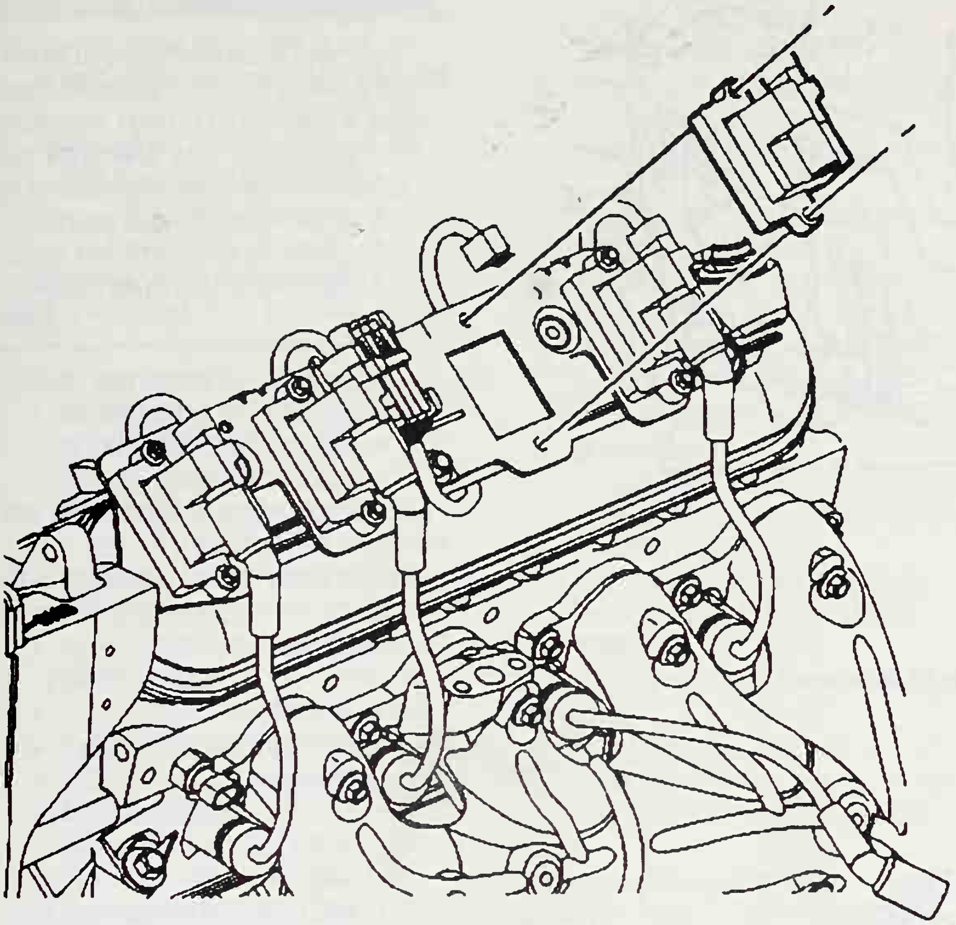
1. Remove or disconnect the following:
    - Negative battery cable
    - Coolant
    - A/C refrigerant
2. Raise the hood to the servicing position. Move the hood hinge bolt to hold the hood in the servicing position.
    - Upper and the lower radiator hoses from the engine
    - Air cleaner duct from the engine
    - A/C condenser mounting bolts
    - Radiator support from the vehicle
    - A/C compressor
    - Coolant hose from the throttle body
    - Heater hoses from the engine and the cowl
    - Engine sight shield from the intake manifold
    - Accelerator control cable mounting bracket from the intake manifold

⁂ CAUTION

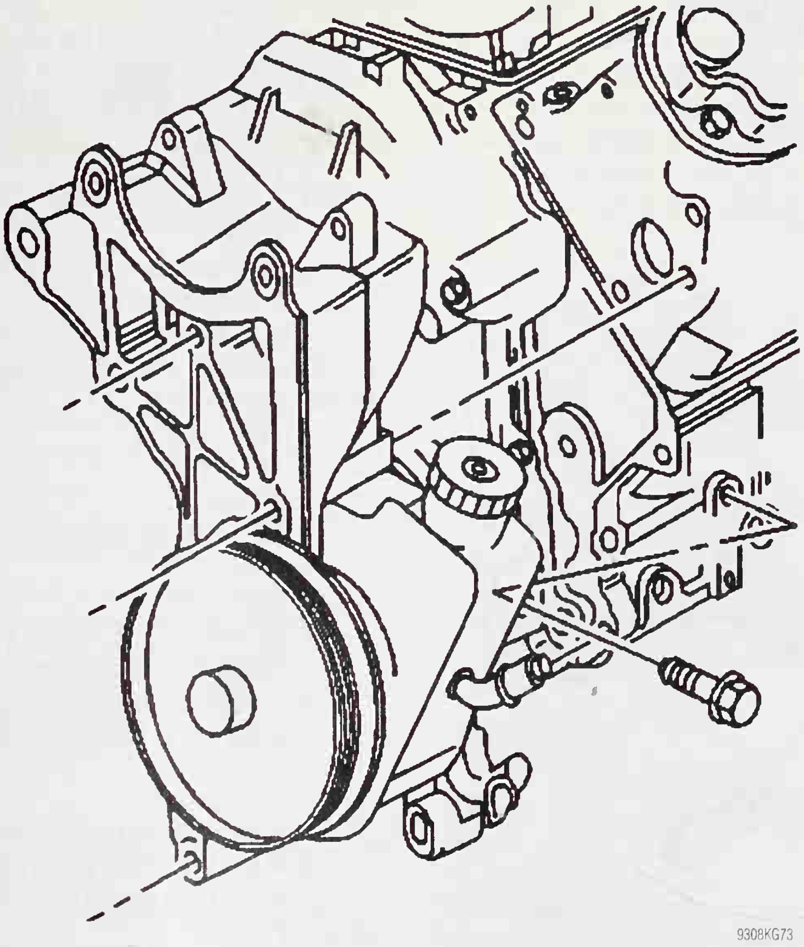
In order to avoid possible injury or vehicle damage, always replace the accelerator control cable with a NEW cable whenever you remove the engine from the vehicle. In order to avoid cruise control cable damage, position the cable out of the way while you remove or install the engine.

- Accelerator control cable and the cruise control cable, if equipped, from the throttle shaft

3. Open the large electrical harness retainer. Remove one 10 mm nut in order to release the engine harness from the intake manifold.
4. Disconnect the electrical connectors from the following:
    - Eight injectors
    - Idle Air Control (IAC) motor
    - Throttle Position (TP) sensor
    - Evaporative Emissions (EVAP) canister purge solenoid
    - Manifold Absolute Pressure (MAP) sensor
    - Camshaft Position (CMP) sensor
    - Ground splice at the rear of the right side of the block
    - Ground splice and the ground strap at the rear of the left side of the block
    - Coolant Temperature (CTS) sensor
    - Oil pressure sensor/switch
    - Electrical connector from intake and disconnect from harness
    - Junction block bracket from alternator bracket
5. Set the electrical harness aside.
6. Remove or disconnect the following:
    - EVAP canister purge solenoid vent tube from the solenoid by squeezing the retainer, then release the tube from the solenoid
    - Battery negative cable from the engine block



Ignition coil removal—4.8L, 5.3L and 6.0L engines



Power steering pump removal—4.8L, 5.3L and 6.0L engines

- Drive belt
- Bolts holding the alternator mounting bracket to the cylinder head and block
- Bolt behind the power steering pump to engine block
- Alternator mounting bracket. Position the bracket aside.
- Fuel pipes from the engine

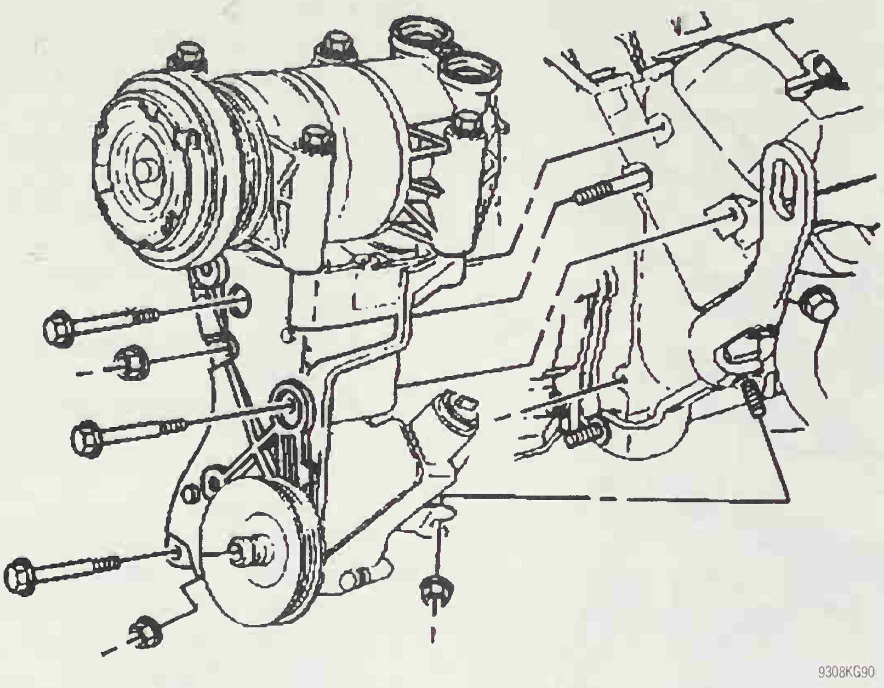
7. Raise the vehicle.
    - Steering linkage under body shield, if equipped
    - Engine oil pan under body shield, if equipped
    - Engine oil
    - Starter motor
8. Disconnect the engine wiring harness from the following components:
    - Crankshaft Position (CKP) sensor
    - Engine oil level sensor
    - Block heater, if equipped
    - Oil pan wiring harness
9. Reposition wiring from the lower engine area.
    - Exhaust pipes from the exhaust manifolds
    - Transmission cooler pipe retainer from the right side of the engine block, if equipped
    - Torque converter shield from the engine
    - Torque converter bolts
    - Nut and the transmission oil level indicator tube from the bellhousing stud
    - Lower bellhousing studs from the engine
10. Lower the vehicle.
    - Remaining bellhousing bolts
    - Engine electrical harness aside
    - Ignition coil(s)
11. Install an engine crane.
12. Install a floor jack or stands to transmission for support.
13. Remove the engine mount bolts.

➡Use care while moving the engine assembly in order to avoid breaking the MAP sensor locating tabs. Broken MAP sensor tabs may result in decreased engine performance.

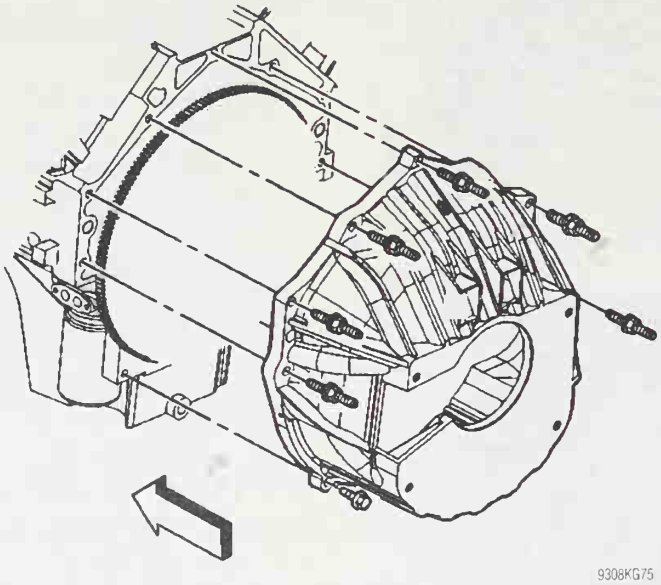
14. Remove the engine from the vehicle.

To install:

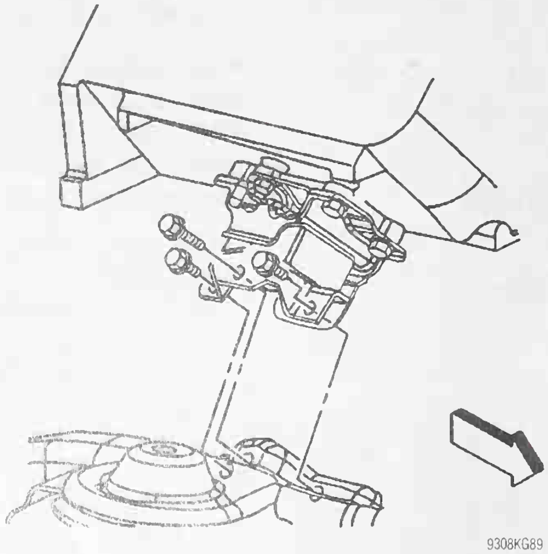
15. Install or connect the following:
    - Engine to the vehicle
    - Engine mount bolts
    - Upper bellhousing bolts
16. Remove transmission support apparatus.
17. Remove the lifting device.
18. Remove the lift brackets from both cylinder heads.



Power steering mount bracket removal—4.8L, 5.3L and 6.0L engines



Bellhousing bolt removal—4.8L, 5.3L and 6.0L engines



Engine mount disconnect—4.8L, 5.3L and 6.0L engines

19. Install the ignition coil(s) and the spark plug wire(s).
20. Route the engine wiring harness to the lower right hand side of the engine.
21. Raise the vehicle.
22. Install or connect the following:
    - Remaining bellhousing bolts
    - Torque converter bolts
    - Torque converter shield
    - Transmission oil level indicator tube and nut to bellhousing stud
    - A/C compressor
    - Transmission cooler pipe retainer to right side of engine block
    - Engine exhaust pipes to the exhaust manifolds
23. Reroute wiring to lower engine area and install bolt to oil pan.
24. Connect electrical connectors to the CKP sensor, the engine oil level sensor and the block heater, if equipped.
25. Install or connect the following:
    - Starter motor
    - Engine oil pan under body shield, if equipped
    - Steering linkage under body shield
26. Lower the vehicle.
    - Fuel pipes to the engine
    - Alternator mounting bracket to the cylinder head using the nuts and the bolts. Tighten the bolts to 37 ft. lbs. (50 Nm).
    - Bolt at the rear of the power steering pump to the engine block and tighten to 37 ft. lbs. (50 Nm)
    - Alternator
    - Drive belt
    - Battery negative cable to the engine block
    - EVAP canister purge solenoid to the intake manifold
27. Route the engine harness over the top of the engine. Attach the connectors for following components:
    - Eight injectors
    - IAC motor
    - TP sensor
    - EVAP canister purge solenoid.
    - MAP sensor
    - CMP sensor
    - Ground splice at the rear of the right side of engine block
    - Ground splice and the ground strap at the rear of the left side of engine block
    - CTS sensor
28. Install or connect the following:
    - Nut to the engine wiring harness bracket and tighten to 89 inch lbs. (10 Nm)

⁂ CAUTION

In order to avoid possible injury or vehicle damage, always replace the accelerator control cable with a NEW cable whenever you remove the engine from the vehicle. In order to avoid cruise control cable damage, position the cable out of the way while you remove or install the engine.

- NEW accelerator control cable
- Cruise control cable, if equipped, to the throttle shaft
- Bolts for the accelerator control cable mounting bracket and tighten to 89 inch lbs. (10 Nm)
- Engine sight shield to the intake manifold
- Heater hoses to the cowl and the engine
- Coolant hose to the throttle body
- Radiator support in the vehicle
- A/C condenser mounting bolts
- Air cleaner duct
- Lower radiator hoses to the engine

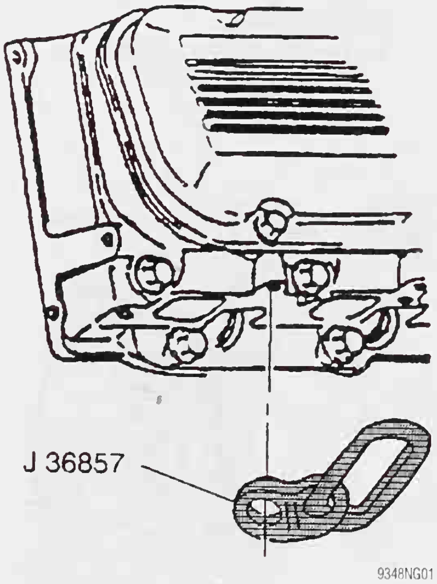
29. Lower the hood.
30. Fill the engine with oil.
31. Fill the engine with coolant.
32. Connect the negative battery cable.

8.1L Engine

1. Raise the hood to the servicing position. Move the hood hinge bolt to hold the hood in the servicing position.
2. Release the fuel system pressure.
3. Remove or disconnect the following:
    - Negative, then positive battery cables
    - Coolant
    - A/C refrigerant
    - Engine oil cooler lines from the engine block
    - Transmission-to-engine bolts
    - Clutch pressure plate bolts, if equipped
    - Torque converter bolts, if equipped
    - Catalytic converter
    - Exhaust manifold pipe
    - Hoses from power steering pump, then plug the lines and ports
    - Starter motor
4. Raise the vehicle.
    - Engine electrical harness and tie aside
    - Alternator
    - Ground cable bolt from engine block
    - Exhaust Gas Recirculation (EGR) valve adapter
    - Vacuum lines (tag before removal)
    - Throttle Actuator Control (TAC) module electrical connector
5. Install Engine Lift Brackets part No. J 36857, or equivalent, to the rear of the right cylinder head and the front of the left cylinder head.
6. Install the attaching bolt and washer. Use part No. 9428217 with 1560963. Tighten the bolts to 30 ft. lbs. (40 Nm).
7. Remove or disconnect the following:
    - Engine mount heat shield bolt and shields
    - Engine mount-to-engine mount bracket bolts
    - Engine from the vehicle, using a suitable lifting device. Place on a suitable stand.
    - A/C compressor/power steering pump bracket from the cylinder head
    - Lift brackets from the cylinder head

To install:

8. Install Engine Lift Brackets part No. J 36857, or equivalent, to the rear of the right cylinder head and the front of the left cylinder head.
9. Install the attaching bolt and washer. Use part No. 9428217 with 1560963. Tighten the bolts to 30 ft. lbs. (40 Nm).
10. Install or connect the following:
    - A/C compressor/power steering mounting bracket. Tighten the bolts and nut to 37 ft. lbs. (50 Nm).
    - Alternator bracket
    - Engine into the vehicle
    - Engine mount-to-engine mount bracket bolts
    - Engine mount heat shield and bolts



Install suitable lift brackets to the rear of the right head and the front of the left head

11. Remove the lift hooks from the cylinder heads, then raise the vehicle.
    - Engine oil cooler lines
    - Transmission-to-engine bolts
    - Clutch pressure plate bolts, if equipped
    - Torque converter bolts, if equipped
    - Catalytic converter
    - Exhaust manifold pipe
    - Hoses to the power steering pump
    - Starter motor
12. Lower the vehicle.
    - Engine electrical harness. Make sure the harness is properly routed.
    - Alternator
    - Ground cable bolt to engine block and tighten to 12 ft. lbs. (16 Nm)
    - EGR valve adapter
    - Vacuum lines, as tagged during removal
    - TAC module electrical connector
    - Radiator
    - A/C compressor
    - Fuel feed and return lines
    - Ignition coils
    - Positive, then negative battery cables
    - Air cleaner outlet duct and secure with the clamp
13. Lower the hood from the service position.
14. Properly recharge the A/C system.
15. Fill the engine with oil.
16. Fill the engine with coolant.
17. Perform the Crankshaft Position (CKP) sensor variation learn procedure:
    a. Install a suitable scan tool and check for Diagnostic Trouble Codes (DTCs). If any DTCs, other than P1336 are set, resolve those codes first, before proceeding with this procedure.
    b. With the scan tool, select the crankshaft position variation learn procedure.
    c. Observe the fuel cut-off for the 8.1L engine.
    d. The scan tool will instruct you to perform certain steps, make sure you follow all directions given by the scan tool exactly.
    e. Enable the crankshaft position system variation learn procedure.

➡**While the learn procedure is in progress, release the throttle immediately when the engine started to decelerate. The engine control is returned to the operator and the engine responds to throttle position after the learn procedure is complete.**

f. Slowly increase the engine speed to the RPM that you observed.

g. Immediately release the throttle when fuel cut-out is reached.

h. The scan tool displays: Learn Status: Learned this ignition. If the scan tool does NOT display this message and not other DTCs set, you must perform further troubleshooting.

i. Turn the ignition **OFF** for 30 seconds after the learn procedure has been completed successfully.

18. Start and run the engine, then check for leaks.

Water Pump

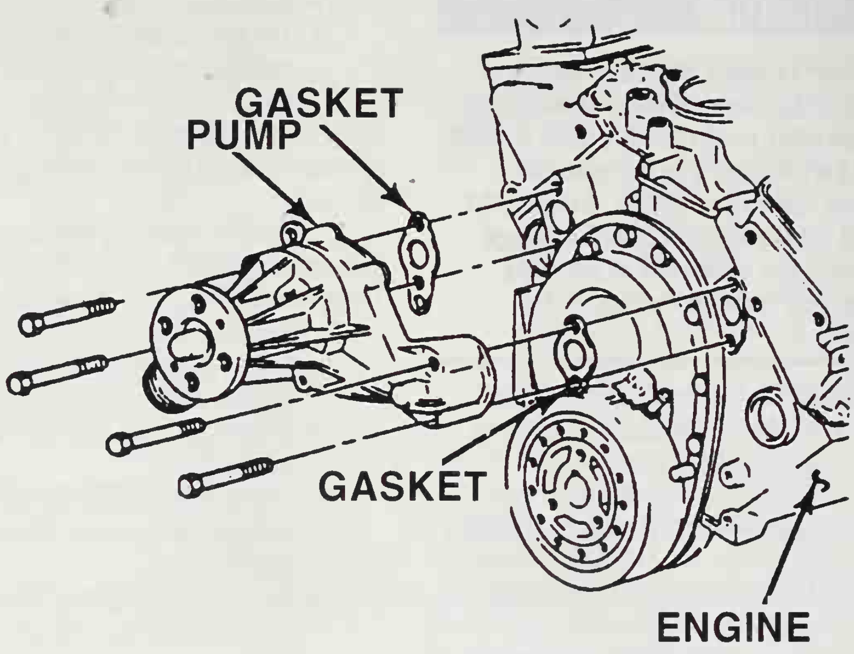
REMOVAL & INSTALLATION

4.3L, 5.0L and 5.7L Engines

1. Drain the radiator.
2. Remove or disconnect the following:
   - Fan shroud
   - Negative battery cable
   - Drive belt(s)
   - Alternator and other accessories, if necessary
   - Fan, fan clutch and pulley
   - Accessory brackets that might interfere with water pump removal
   - Lower radiator hose from the water pump inlet
   - Heater hose from the nipple on the pump
   - Water pump assembly away from the timing cover

To install:

3. Clean all old gasket material from the timing chain cover.
4. Install or connect the following:
   - Pump assembly with a new gasket. Torque the bolts to 30 ft. lbs. (41 Nm).
   - Hose between the water pump inlet and the pump



Exploded view of the water pump mounting—5.0L and 5.7L engines

   - Fan, fan clutch and pulley
   - Alternator and other accessories, if necessary
   - Drive belt(s)
   - Upper radiator shroud
5. Refill the cooling system.
6. Connect the battery.

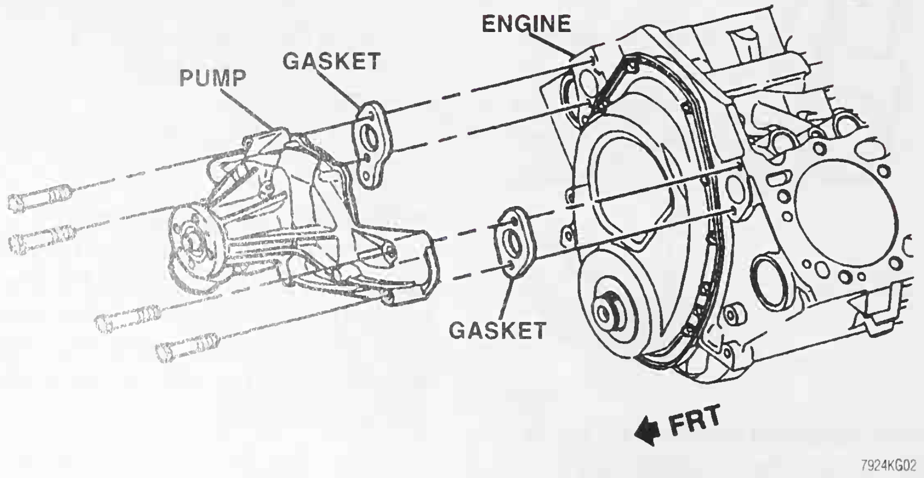
4.8L, 5.3L and 6.0L Engines

1. Remove or disconnect the following:
   - Air outlet duct
   - Coolant
   - Inlet radiator hose from the water pump
   - Upper fan shroud
   - Cooling fan and clutch assembly
   - Drive belt
   - Radiator outlet hose from the coolant pump
   - Surge tank hose
   - Heater hose
   - Water pump

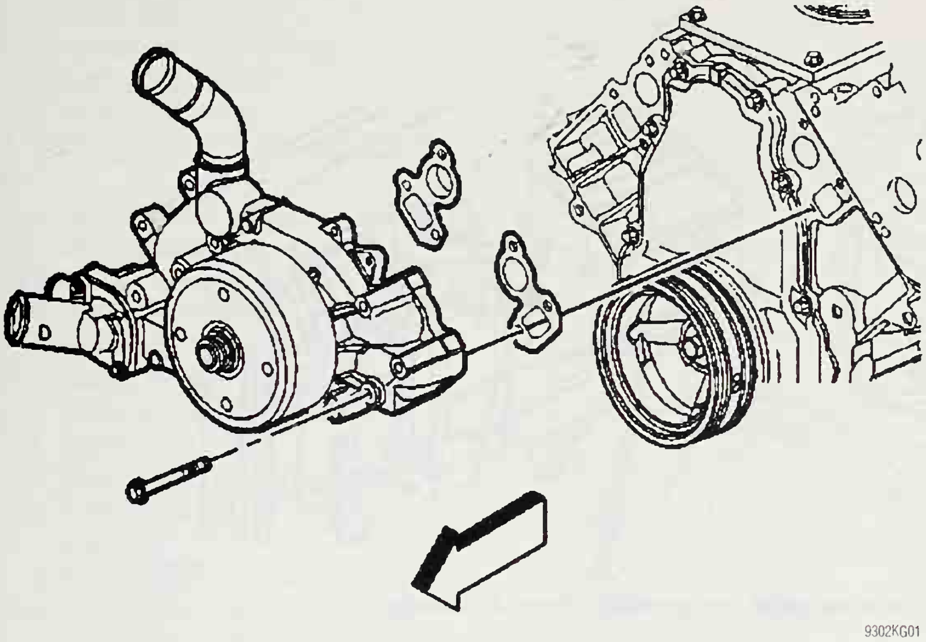
To install:

➡DO NOT use cooling system seal tabs (or similar compounds) unless otherwise instructed. The use of cooling system seal tabs (or similar compounds) may restrict coolant flow through the passages of the cooling system or the engine components. Restricted coolant flow may cause engine overheating and/or damage to the cooling system or the engine components/assembly.

2. Install or connect the following:
   - Water pump. Install the water pump bolts. Tighten the water pump bolts first pass to 11 ft. lbs. (15 Nm); tighten the bolts final pass to 22 ft. lbs. (30 Nm).
   - Water pump drive belt pulley and bolts (if applicable). Tighten the pulley bolts first pass to 89 inch lbs. (10 Nm); tighten the bolts final pass to 18 ft. lbs. (25 Nm).
   - Surge tank hose
   - Heater hose
   - Outlet radiator hose to the coolant pump
   - Drive belt
   - Cooling fan and clutch assembly
   - Upper fan shroud
   - Inlet radiator hose to the water pump
   - Air inlet duct
   - Coolant



Exploded view of the water pump mounting—4.3L engine



Exploded view of the water pump assembly—4.8L, 5.3L and 6.0L engines

8.1L Engines

1. Remove or disconnect the following:
   - Coolant
   - Drive belt
   - Fan clutch
   - Outlet hose clamp and hose
2. Reposition the bypass hose clamps at the water pump and water crossover
   - Bypass hose
   - Water pump bolt and pump. Discard the water pump gaskets.

To install:

3. Install or connect the following:
   - New water pump gaskets.
   - Water pump and bolts. Tighten the water pump bolts 37 ft. lbs. (50 Nm).
   - Bypass hose and clamps
   - Outlet hose and clamp
   - Fan clutch
   - Drive belt

- Surge tank hose
- Heater hose
- Outlet radiator hose to the coolant pump
- Drive belt
- Cooling fan and clutch assembly
- Upper fan shroud
- Inlet radiator hose to the water pump
- Air inlet duct
- Coolant

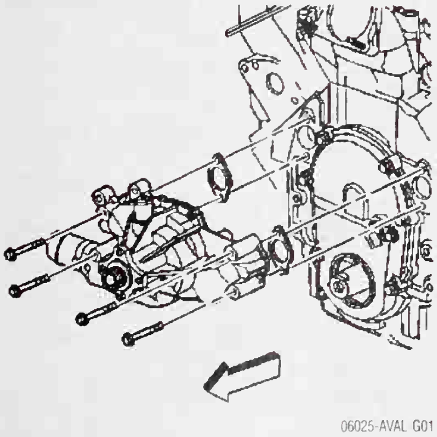
Heater Core

REMOVAL & INSTALLATION

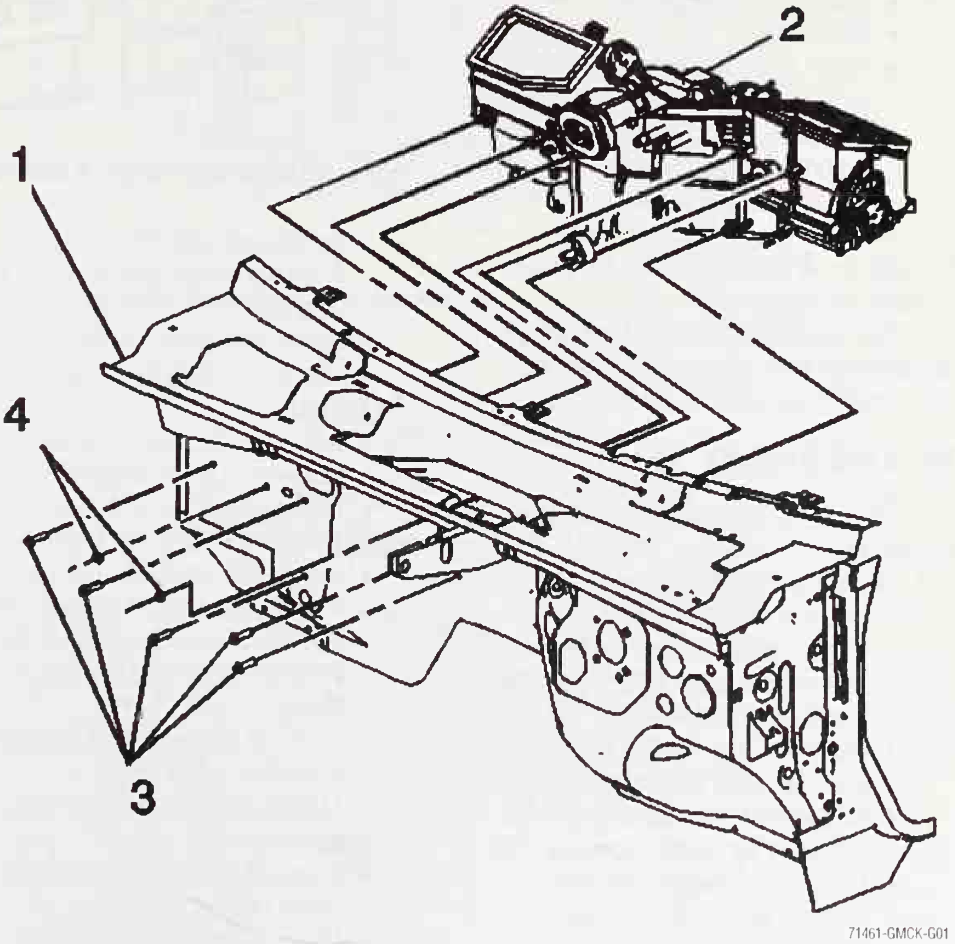
Avalanche

➡This procedure requires the use of J 43181 Quick Connect Connector Removal Tool or equivalent.

1. Drain the engine cooling system into a clean container for reuse.
2. Remove or disconnect the following:
   - Negative battery cable
   - Air conditioning refrigerant, using the proper equipment
3. Using the J 43181 or equivalent quick connect tool, disconnect the inlet heater hose from the heater core.
   a. Install the tool to the heater core pipe.
   b. Close the tool around the heater core pipe.
   c. Firmly pull the tool into the quick connect end of the heater hose.



Exploded view of the water pump assembly—8.1L engine



Remove the nuts (4), bolts (3), then remove the HVAC module (2) from the vehicle (1)—Avalanche

d. Firmly grasp the heater hose. Pull the heater hose forward in order to disengage the inlet hose from the heater core.

4. Disconnect the surge tank outlet hose from the heater core using tool J 43181.

5. Remove or disconnect the following:
    - Accumulator
    - Instrument panel carrier
    - HVAC module drain hose
    - Electrical harnesses and the ground connections from the HVAC module
    - Retaining nuts and bolts and HVAC module
    - Screws from the heater core cover
    - Cover from the HVAC module
    - Heater core cowl gasket from the heater core
    - Heater core from the HVAC module assembly

To install:

6. Install or connect the following
    - Heater core to the HVAC module
    - Heater core cowl gasket
    - HVAC module cover and secure with the retaining screws
    - HVAC module into position. Torque the nuts to 90 inch lbs. (8 Nm) and the bolts to 35 inch lbs. (4 Nm).
    - Electrical connectors to the module
    - Instrument panel carrier
    - Accumulator
    - Hoses to the heater core. Firmly push the hoses on until you hear an audible "click" to be sure they are properly seated.
    - Negative battery cable.

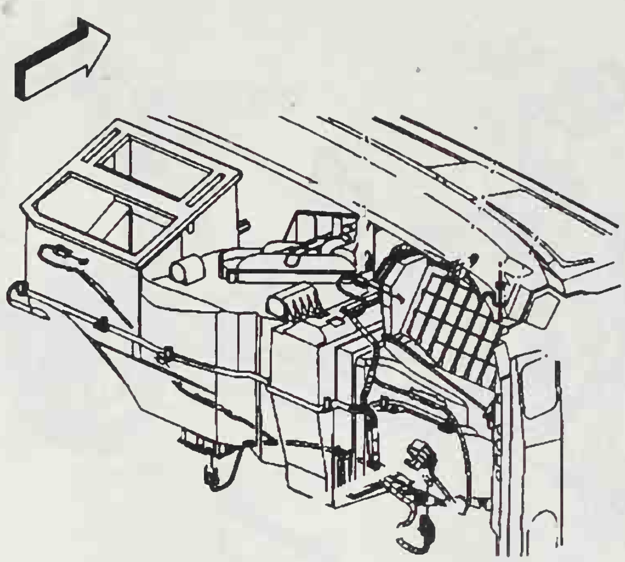
7. Refill the engine cooking system. Recharge the A/C system, using the proper methods and equipment.

8. Run the engine to normal operating temperatures; then, check the climate control operation and check for leaks.

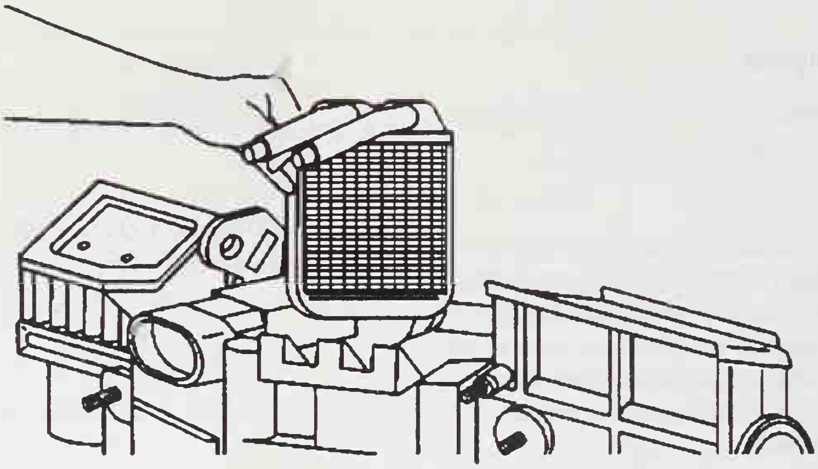
Sierra and Silverado

1. Drain the engine cooling system into a clean container for reuse.

2. Remove or disconnect the following:
    - Negative battery cable
    - Heater hoses from the heater core
    - Temperature control cable from the heater case assembly
    - Disconnect the mode control cable from the heater case assembly
    - Instrument panel carrier to provide access to the heater case assembly
    - Electrical connectors that may interfere with the heater case assembly removal
    - Heater case assembly-to-chassis screws/nuts and the assembly. Place the heater case assembly on a bench.
    - Heater core cover screws
    - Heater core from the heater case



View of the heater case assembly—Sierra & Silverado



View of the heater core—Sierra & Silverado

To install:

3. Install or connect the following:
    - Heater core to the heater case
    - Heater core cover screws and tighten to 14 inch lbs. (1.6 Nm)
    - Heater case assembly and the assembly-to-chassis screws, then, tighten the screws to 35 inch lbs. (4 Nm) and the nuts to 80 inch lbs. (9 Nm)
    - Electrical connectors, as necessary
    - Instrument panel carrier
    - Mode control cable to the heater case assembly
    - Temperature control cable to the heater case assembly
    - Heater hoses to the heater core
    - Negative battery cable.

4. Refill the engine cooking system.

5. Run the engine to normal operating temperatures; then, check the climate control operation and check for leaks.

Express and Savana

FRONT HEATER

1. Drain the engine cooling system into a clean container for reuse.

2. Discharge and recover the air conditioning system refrigerant.

3. Remove or disconnect the following:
    - Negative battery cable
    - Heater hoses from the heater core
    - Surge tank (diesel) or the coolant recovery reservoir (except diesel).
    - Positive battery cable, the battery hold-down and the battery
    - Refrigeration lines from the air conditioning accumulator and discard the gaskets

- Air conditioning accumulator
- Lower right kick panel and the knee bolster, from the right side
- Lower outer floor air outlet duct
- Heater case screws

4. Carefully open the heater core access door.
    - Heater core-to-heater case retainers and the heater core

To install:

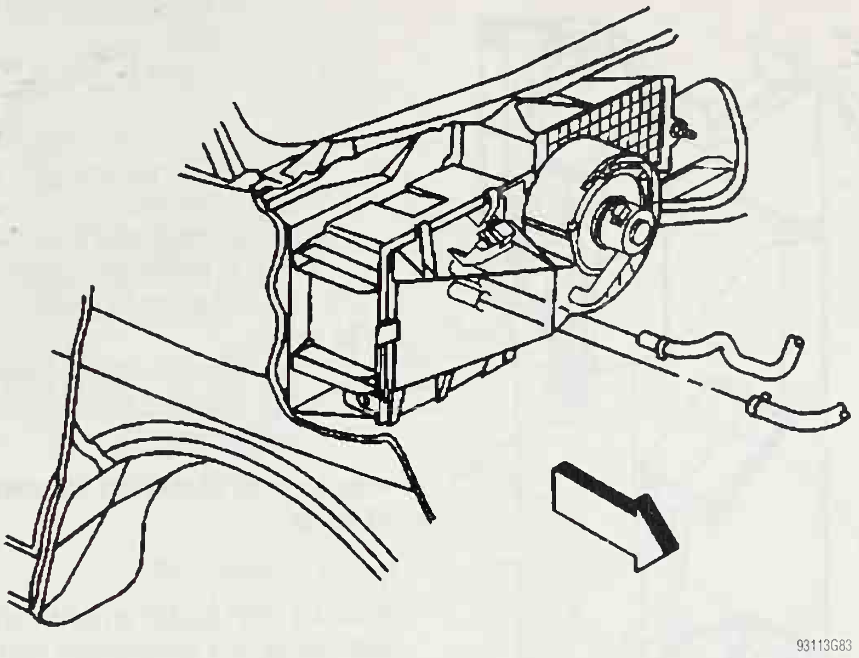
5. Install or connect the following:
    - Heater core and the heater core-to-heater case retainers. Carefully, close the heater core access door.
    - Heater case screws
    - Lower outer floor air outlet duct
    - Knee bolster and the lower right kick panel
    - Air conditioning accumulator.
    - Refrigeration lines to the air conditioning accumulator, using new gaskets
    - Battery, the battery hold-down and the positive battery cable
    - Surge tank (diesel) or the coolant recovery reservoir (except diesel)
    - Heater hoses to the heater core
6. Evacuate and charge the air conditioning system.
7. Refill the engine cooling system.
8. Connect the negative battery cable.
9. Run the engine to normal operating temperatures; then, check the climate control operation and check for leaks.

REAR AUXILIARY HEATER

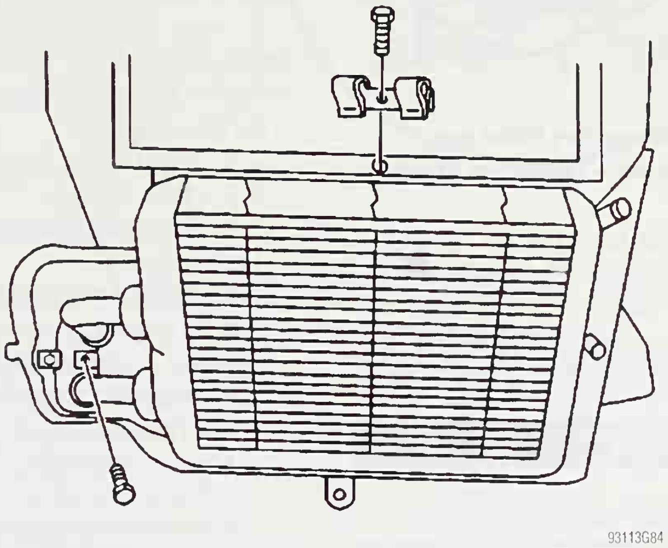
1. Drain the engine cooling system into a clean container for reuse.
2. Remove or disconnect the following:
    - Negative battery cable
    - Heater hoses from the rear auxiliary heater core
    - Rear interior quarter trim panel from the left rear side
    - Blower motor from the rear auxiliary heater case
    - Rear auxiliary heater case retainers and the case
    - Lower auxiliary heater case retainers and the lower case
    - Rear heater core from the case

To install:

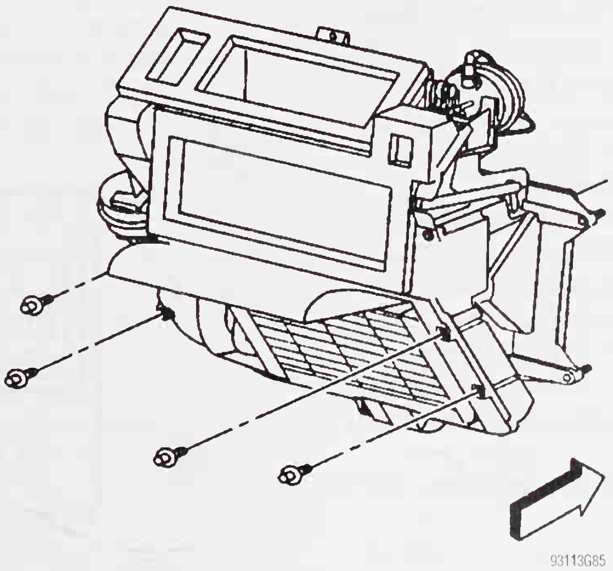
3. Install or connect the following:
    - Rear auxiliary heater core to the case
    - Lower case and the lower auxiliary heater case retainers
    - Rear auxiliary heater case retainers and the case
    - Blower motor to the rear auxiliary heater case



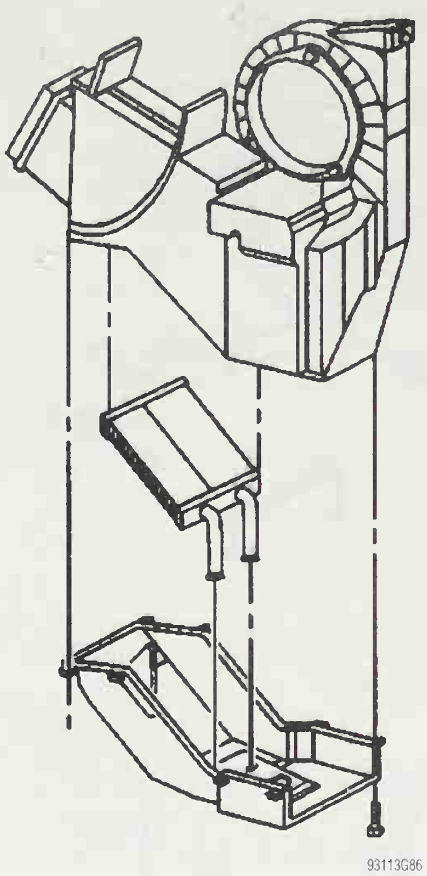
Underhood view of the heater assembly—Express and Savana



View of the heater case screws—Express and Savana



View of the heater core and retainers—Express and Savana



View of the rear auxiliary heater core, case and retainers— Express and Savana

- Rear interior quarter trim panel
- Heater hoses to the rear auxiliary heater core

4. Refill the engine cooling system.
5. Connect the negative battery cable.

Cylinder Head

REMOVAL & INSTALLATION

4.3L Engine—Express and Savana

1. Drain the coolant.
2. Remove or disconnect the following:
    - Negative battery cable
    - Engine cover, if equipped
    - Fan shroud
    - Intake manifold
    - Exhaust manifold
    - Air pipe at the rear of the right cylinder head, if applicable
    - Alternator mounting bolt at the right cylinder head
    - Alternator, if necessary
    - Power steering pump and brackets from the left cylinder head and lay aside
    - Air conditioner compressor, and lay aside
    - Spark plug wires at their brackets
    - Ground strap from the right side and the coolant sensor wire from the left head
    - Cylinder cover
    - Spark plugs
    - Pushrods. Identify the pushrods so that they can be installed in their original positions.
    - Cylinder head bolts in the reverse order of the tightening sequence
    - Cylinder head and gasket

To install:

3. Clean all gasket mating surfaces.
4. Install or connect the following:
    - New gasket

➡Be sure the gasket has the word HEAD up.

- Cylinder head

➡Coat a steel gasket on both sides with sealer. If a composition gasket is used, do not use sealer.

5. Clean the cylinder head bolts, apply sealer to the threads, and hand-tighten.
6. Install the cylinder head bolts in sequence to 22 ft. lbs. (30 Nm) The bolts must, then be tightened again in sequence in the following order:
    a. Step 1: Short length bolt: (11, 7, 3, 2, 6, 10) 55 degrees.
    b. Step 2: Medium length bolt: (12, 13) 65 degrees.
    c. Step 3: Long length bolts: (1, 4, 8, 5, 9) 75 degrees.
7. Install or connect the following
    - Pushrods (adjust the rocker arms, if necessary)
    - Spark plugs
    - Rocker arm cover
    - Air conditioner compressor
    - Power steering pump and brackets
    - Alternator or the alternator mounting bolt at the cylinder head
    - Air pipe at the rear of the head if removed
    - Exhaust manifold
    - Intake manifold
    - Engine cover, if removed
8. Refill the engine with coolant.
9. Connect the negative battery cable.

4.3L Engine—Silverado and Sierra

LEFT SIDE

1. Remove or disconnect the following:
    - Battery negative cable
    - Coolant
    - Accessory drive belt
    - Cooling fan assembly
    - Power steering pump mounting bracket
    - Power steering pump mounting bracket stud from the cylinder head
    - Lower intake manifold
    - Exhaust manifold
    - Spark plug wire harness and the spark plug wire support
    - Valve pushrods
    - Ground strap and ground wire bolt from the rear of the cylinder head
    - Engine Coolant Temperature (ECT) sensor (if applicable)
    - ECT gauge sensor (if applicable)
    - Spark plugs
    - Spark plug wire support
    - Cylinder head bolts
    - Cylinder head and the gasket

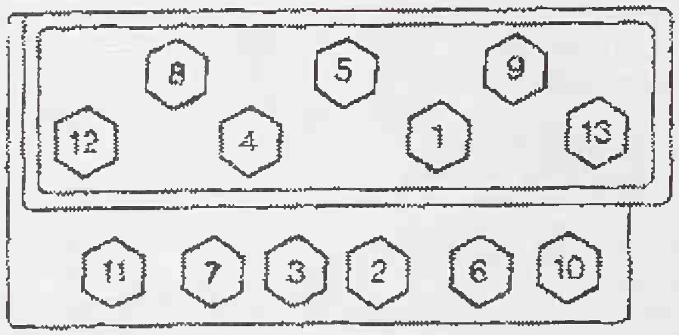
➡Clean all dirt, debris, and coolant from the engine block cylinder head bolt holes. Failure to remove all foreign material may result in damaged threads, improperly tightened fasteners or damage to components.

2. Clean the cylinder head bolts and the engine block bolt holes.

To install:

3. Inspect the dowel pins (cylinder head locator) for proper installation.

➡Do not use any type sealer on the cylinder head gasket (unless specified).

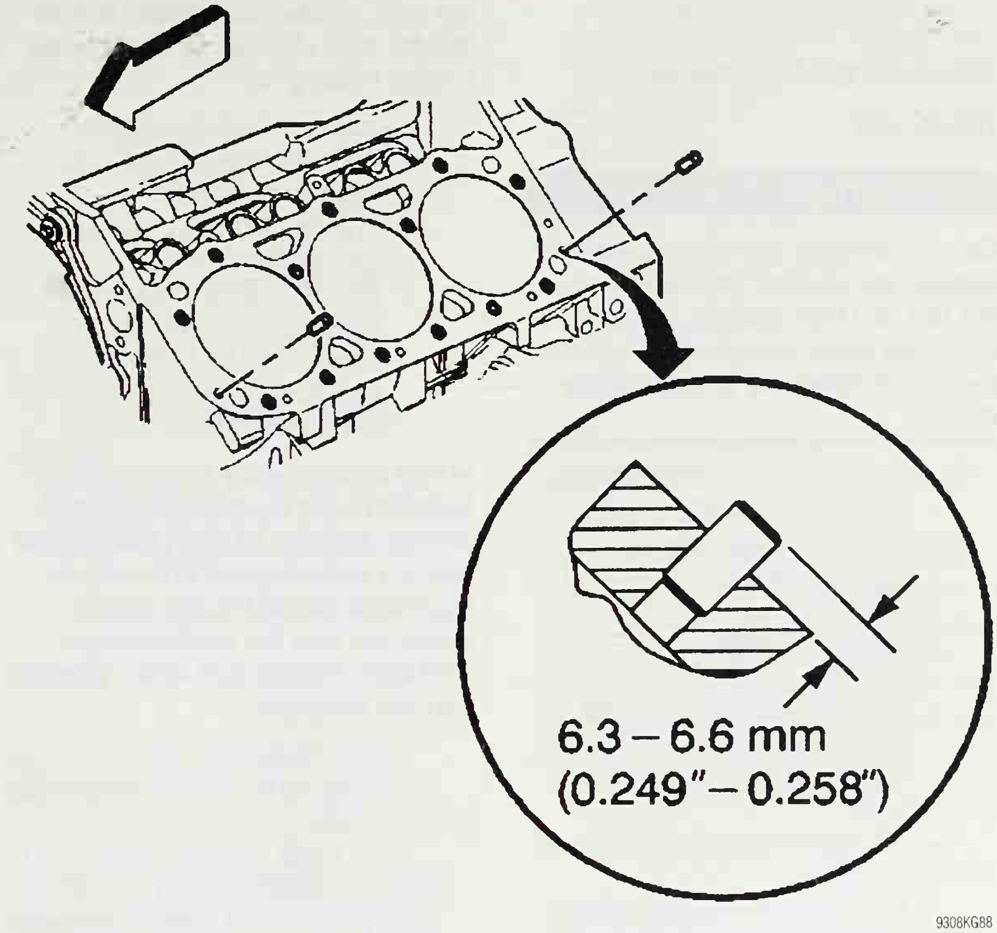


Cylinder head bolt tightening sequence—4.3L engine

4. Install or connect the following:
   - NEW cylinder head gasket in position over the dowel pins (cylinder head locator)
   - Cylinder head onto the engine block. Guide the cylinder head carefully into place over the dowel pins and the cylinder head gasket.
   - Sealant GM P/N 12346004, or equivalent, to the threads of the cylinder head bolts
   - Cylinder head bolts finger-tight
5. Tighten the cylinder head bolts in sequence:
   a. First pass: 22 ft. lbs. (30 Nm).
   b. Second pass: Long bolts (1, 4, 5, 8, and 9)—+ 75 degrees.
   c. Second pass: Medium bolts (12 and 13)—+ 65 degrees.
   d. Second pass: Short bolts (2, 3, 6, 7, 10, and 11)—+ 55 degrees.
6. Install or connect the following:
   - Spark plug wire support and bolts. Tighten to 106 inch lbs. (12 Nm).
   - Spark plugs. Tighten to 11 ft. lbs. (15 Nm), if USED; 22 ft. lbs. (30 Nm), if NEW.
7. If reusing the ECT gauge sensor (if applicable), apply sealant GM P/N 12346004 or equivalent to the threads of the ECT gauge sensor. Install the ECT gauge sensor (if applicable). Tighten the sensor to 15 ft. lbs. (20 Nm).
8. Install or connect the following:
   - Ground strap and the ground wire bolt. Tighten the bolt to 12 ft. lbs. (16 Nm).
   - Valve pushrods
   - Lower intake manifold
   - Exhaust manifold
   - Stud for the power steering pump mounting bracket to the cylinder head. Tighten the power steering pump mounting bracket stud to 15 ft. lbs. (20 Nm).
   - Power steering pump mounting bracket
   - Engine cooling fan assembly
   - Coolant
   - Battery negative cable

RIGHT SIDE

1. Remove or disconnect the following:
   - Battery negative cable
   - Coolant
   - Engine cooling fan assembly
   - Alternator mounting bracket
   - Alternator mounting bracket stud from the cylinder head
   - Lower intake manifold
   - Exhaust manifold



Dowel pin installation—4.3L

   - Spark plug wire harness and spark plug wire support
   - Valve pushrods
   - Cylinder head and the gasket
2. Clean the engine block and the cylinder head sealing surfaces.

To install:

3. Inspect the dowel pins (cylinder head locator) for proper installation.

➡Do not use any type sealer on the cylinder head gasket (unless specified).

4. Install or connect the following:
   - NEW cylinder head gasket in position over the dowel pins (cylinder head locator)
   - Cylinder head onto the engine block. Guide the cylinder head carefully into place over the dowel pins and the cylinder head gasket.
   - Sealant GM P/N 12346004 or equivalent to the threads of the cylinder head bolts
   - Cylinder head bolts finger-tight
5. Tighten the cylinder head bolts in sequence:
   a. First pass: 22 ft. lbs. (30 Nm).
   b. Second pass: Long bolts (1, 4, 5, 8, and 9)—+ 75 degrees.
   c. Second pass: Medium bolts (12 and 13)—+ 65 degrees.
   d. Second pass: Short bolts (2, 3, 6, 7, 10, and 11)—+ 55 degrees.
6. Install or connect the following:
   - Spark plug wire support and bolts. Tighten only the rear support bolt to 106 inch lbs. (12 Nm).

➡The front spark plug wire support bolt is used to fasten the oil level indicator tube, and will be installed within the oil level indicator tube installation procedure.

   - Front spark plug wire support bolt
   - Spark plugs. Tighten to 11 ft. lbs. (15 Nm), if USED; 22 ft. lbs. (30 Nm), if NEW.
   - Valve pushrods
   - Lower intake manifold
   - Spark plug wire harness and wire support. Tighten to 106 inch lbs. (12 Nm).
   - Exhaust manifold
   - Stud for the alternator mounting bracket. Tighten the alternator mounting bracket stud to 15 ft. lbs. (20 Nm).
   - Alternator mounting bracket
   - Engine cooling fan assembly

- Coolant
- Battery negative cable

4.8L, 5.3L and 6.0L Engines

RIGHT SIDE

CAUTION

Before servicing any electrical component, the ignition key must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures.

1. Remove or disconnect the following:
   - Negative battery cable
   - Coolant air bleed pipe
   - Intake manifold
   - Push rods
   - Exhaust manifold(s)
   - Alternator
   - Alternator mounting bracket-to-cylinder head bolts
   - Bolt behind the power steering pump
   - Alternator mounting bracket and set it aside
   - Bolt holding the oil level indicator tube to the right side cylinder head
   - Oil level indicator tube
   - Cylinder head(s) from the engine
   - Spark plugs

➡The M11 cylinder head bolts are NOT reusable. Install NEW M11 cylinder head bolts during reassembly.

- Cylinder head bolts

➡After removal, place the cylinder head on two wood blocks to prevent damage.

2. Remove the gasket. Discard the gasket. Discard the M11 cylinder head bolts.

To install:

➡Do not use any type sealant on the cylinder head gasket (unless specified). The cylinder head gaskets must be installed in the proper direction and position.

3. Clean the engine block cylinder head bolt holes (if required). Thread repair tool J 42385-107 may be used to clean the threads of old threadlocking material.
4. Spray cleaner GM P/N 12346139, P/N 12377981, or equivalent into the hole.
5. Clean the cylinder head bolt holes with compressed air.
6. Check the cylinder head locating pins for proper installation.

➡When properly installed, the tab on the right cylinder head gasket will be located right of center or closer to the front of the engine.

7. Install or connect the following:
   - NEW right cylinder head gasket onto the locating pins
   - Cylinder head onto the locating pins and the gasket
   - NEW M11 cylinder head bolts. Apply a 0.20 in. (5mm) band of threadlock GM P/N 12345382 or equivalent to the threads of the M8 cylinder head bolts.

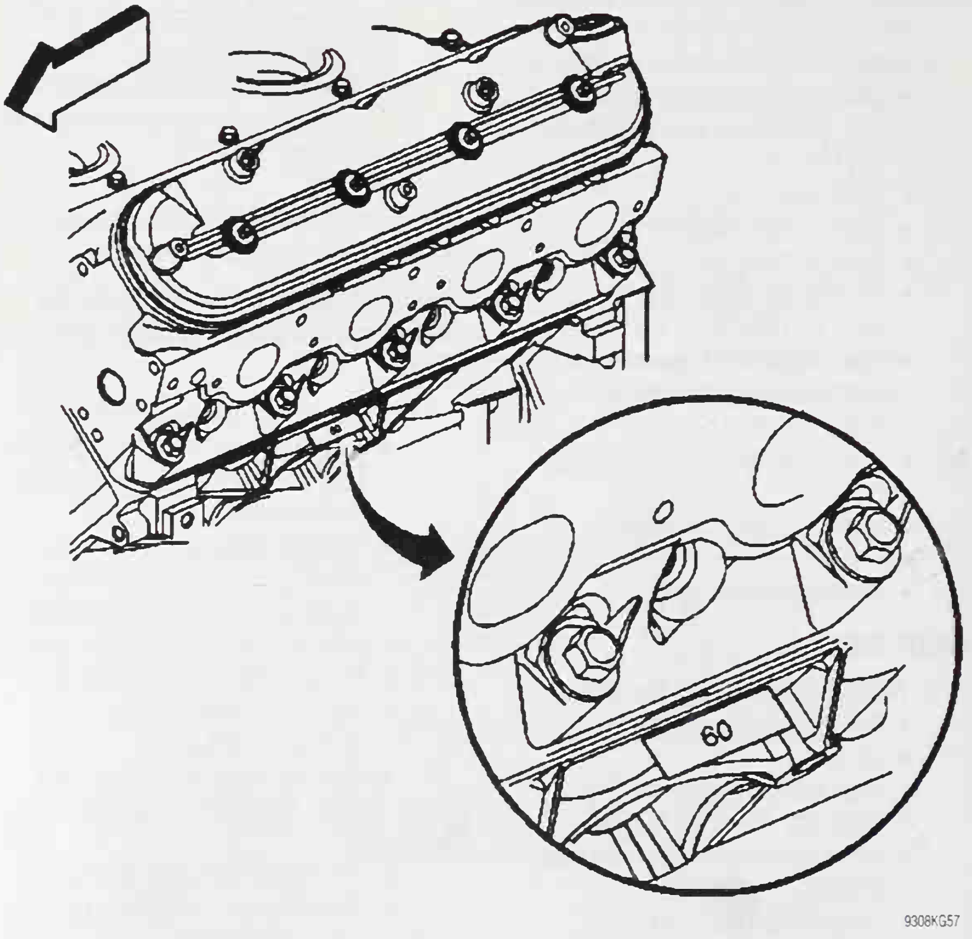
➡First design engine blocks have different drill and tap depths using both medium length 3.94 inch (100mm) and long 6.1 inch (155mm) M11 cylinder head bolts. Second design engine blocks use only the medium length 3.94 inch (100mm) bolt with a common drill and tap depth.

- M8 cylinder head bolts.

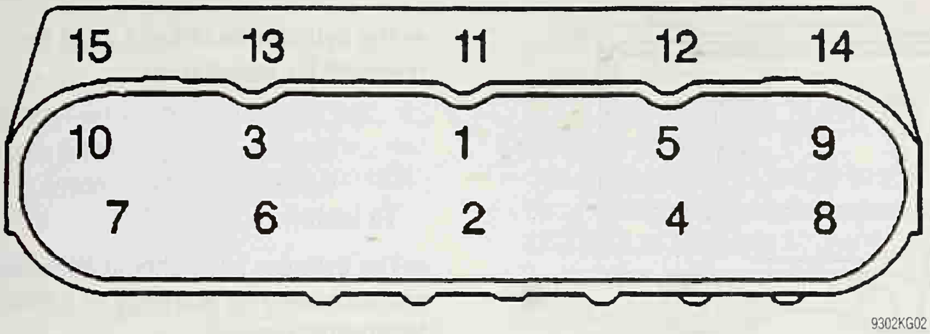
8. Tighten the first design cylinder head bolts as follows:
   a. M11 bolts 1st pass: in sequence to 22 ft. lbs. (30 Nm).
   b. M11 bolts 2nd pass: in sequence + 90 degrees.
   c. M11 bolts (1,2,3,4,5,6,7,8): + 90 degrees.
   d. M11 bolts (9 and 10): + 50 degrees.
   e. M8 cylinder head bolts (11,12,13,14,15) to 22 ft. lbs. (30 Nm). Begin with the center bolt (11) and alternating side-to-side, work outward tightening all of the bolts.
9. Tighten the second design cylinder head bolts as follows:
   a. M11 bolts (1-10) 1st pass: in sequence to 22 ft. lbs. (30 Nm).
   b. M11 bolts (1-10) 2nd pass: in sequence + 90 degrees.
   c. M11 bolts (1-10): + 70 degrees.
   d. M8 cylinder head bolts (11,12,13,14,15) to 22 ft. lbs. (30 Nm). Begin with the center bolt (11) and alternating side-to-side, work outward tightening all of the bolts.

➡The cylinder head gasket displacement can be verified by markings visible on the underside of the right gasket locating tab. Some 4.8/5.3L head gaskets may have 53 stamped onto the locating tab. Some 6.0L head gaskets may have 60 stamped onto the locating tab.

10. Install or connect the following:



Locating tab—4.8L, 5.3L and 6.0L engines



Cylinder head bolt tightening sequence—4.8L, 5.3L and 6.0L engines

- Alternator
- Exhaust manifold(s)
- Pushrods
- Intake manifold
- Negative battery cable

LEFT SIDE

CAUTION

Before servicing any electrical component, the ignition key must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures.

1. Remove or disconnect the following:
   - Negative battery cable
   - Intake manifold
   - Push rods
   - Exhaust manifold(s)
   - Alternator
   - Alternator mounting bracket-to-cylinder head bolts
   - Bolt behind the power steering pump
   - Alternator mounting bracket and set it aside
   - Oil level indicator tube-to-cylinder head bolt
   - Oil level indicator tube
   - Cylinder head from the engine
   - Spark plugs

➡The M11 cylinder head bolts are NOT reusable. Install NEW M11 cylinder head bolts during assembly.

2. Remove the cylinder head bolts.

➡After removal, place the cylinder head on two wood blocks to prevent damage.

3. Remove the gasket. Discard the gasket. Discard the M11 cylinder head bolts.

To install:

➡Do not use any type sealant on the cylinder head gasket (unless specified). The cylinder head gaskets must be installed in the proper direction and position.

4. Clean the engine block cylinder head bolt holes (if required). Thread repair tool J 42385-107 may be used to clean the threads of old threadlocking material.
5. Spray cleaner GM P/N 12346139, P/N 12377981, or equivalent into the hole.
6. Clean the cylinder head bolt holes with compressed air.
7. Check the cylinder head locating pins for proper installation.

➡When properly installed, the tab on the left cylinder head gasket will be located left of center or closer to the front of the engine.

8. Install or connect the following:
   - NEW left cylinder head gasket onto the locating pins
   - Cylinder head onto the locating pins and the gasket
   - NEW M11 cylinder head bolts.
9. Apply a 0.20 in. (5mm) band of threadlock GM P/N 12345382 or equivalent to the threads of the M8 cylinder head bolts.
   - M8 cylinder head bolts

➡First design engine blocks have different drill and tap depths using both medium length 3.94 inch (100mm) and long 6.1 inch (155mm) M11 cylinder head bolts. Second design engine blocks use only the medium length 3.94 inch (100mm) bolt with a common drill and tap depth.

   - M8 cylinder head bolts.

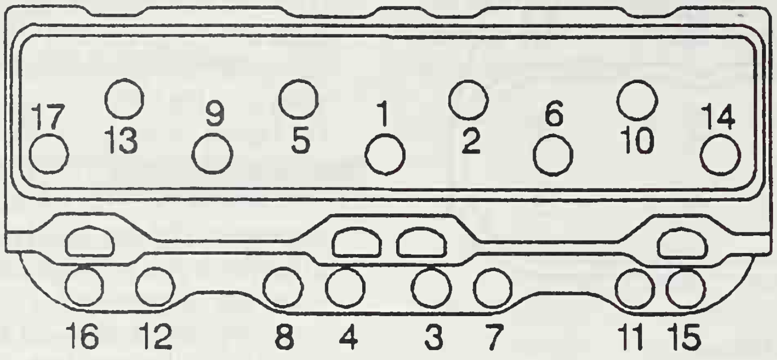
10. Tighten the first design cylinder head bolts as follows:
    a. M11 bolts 1st pass: in sequence to 22 ft. lbs. (30 Nm).
    b. M11 bolts 2nd pass: in sequence + 90 degrees.
    c. M11 bolts (1,2,3,4,5,6,7,8): + 90 degrees.
    d. M11 bolts (9 and 10): + 50 degrees.
    e. M8 cylinder head bolts (11,12,13,14,15) to 22 ft. lbs. (30 Nm). Begin with the center bolt (11) and alternating side-to-side, work outward tightening all of the bolts.
11. Tighten the second design cylinder head bolts as follows:
    a. M11 bolts (1-10) 1st pass: in sequence to 22 ft. lbs. (30 Nm).
    b. M11 bolts (1-10) 2nd pass: in sequence + 90 degrees.
    c. M11 bolts (1-10): + 70 degrees.
    d. M8 cylinder head bolts (11,12,13,14,15) to 22 ft. lbs. (30 Nm). Begin with the center bolt (11) and alternating side-to-side, work outward tightening all of the bolts.

➡The cylinder head gasket displacement can be verified by markings visible on the top side of the left gasket locating tab. Some 4.8/5.3L head gaskets may have 53 stamped onto the locating tab. Some 6.0L head gaskets may have 60 stamped onto the locating tab.

12. Install or connect the following:
    - Alternator mounting bracket. Tighten the four bolts to 37 ft. lbs. (50 Nm).
    - Bolt at the rear of the power steering pump and tighten to 37 ft. lbs. (50 Nm).
    - Exhaust manifold(s)
    - Pushrods
    - Intake manifold
    - Negative battery cable

5.0L and 5.7L Engines

1. Drain the coolant.
2. Remove or disconnect the following:
   - Negative battery cable
   - Engine cover
   - Coolant recovery reservoir, if applicable
   - Intake manifold
   - Exhaust manifolds and position them out of the way
   - Ground strap at the rear of the right AIR pipe, if equipped
3. For vans with A/C, remove the A/C compressor and the forward mounting bracket and lay the compressor aside. Do not disconnect any of the refrigerant lines.
   - Exhaust Gas Recirculation (EGR) inlet tube
4. On the right side cylinder head, disconnect the fuel pipe, spark plug wires and wiring harness bracket.
   - Nut and stud attaching the main accessory bracket to the cylinder head



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Cylinder head bolt tightening sequence—5.0L and 5.7L engines

➡You may have to loosen the remaining bolts and studs in order to remove the head.

- Coolant sensor wire
- Spark plug wire bracket
- Cylinder head covers
- Spark plugs
- Pushrods. Identify the pushrods so that they can be installed in their original positions.
- Cylinder head bolts in the reverse order of the tightening sequence
- Heads

To install:

5. Inspect the cylinder head and block mating surfaces. Clean all old gasket material.

6. Install or connect the following:
   - Cylinder heads using new gaskets. Install the gaskets with the word **HEAD** up.

➡Coat a steel gasket on both sides with sealer. If a composition gasket is used, do not use sealer.

7. Clean the bolts, apply sealer to the threads, and hand-tighten.

8. Install the cylinder head bolts in sequence to 22 ft. lbs. (30 Nm). The bolts must be tightened once, then be tightened again in sequence in the following order:
   a. Step 1: Short length bolt: (3, 4, 7, 8, 11, 12, 15, 16), plus 55 degrees.
   b. Step 2: Medium length bolt: (14, 17), plus 65 degrees.
   c. Step 3: Long length bolts: (1, 2, 5, 6, 9, 10, 13), plus 75 degrees.

9. Install or connect the following:
   - Pushrods in their original positions
   - Cylinder head covers
   - Spark plugs
   - Coolant sensor wire
   - Spark plug wire bracket
   - Main accessory bracket to the cylinder head
   - EGR vent tube
   - Fuel pipe
   - Spark plug wires
   - Wiring harness bracket
   - A/C compressor and forward mounting bracket
   - Ground strap to the rear of the right AIR pipe
   - Exhaust manifolds
   - Intake manifold
   - Coolant recovery reservoir, if removed
   - Engine cover
   - Negative battery cable

10. Refill the engine with coolant.

8.1L Engine

LEFT SIDE

1. Drain the cooling system.
2. Remove or disconnect the following:
   - Negative battery cable
   - Water crossover
   - Intake manifold
   - Valve cover
   - Rocker arms and pushrods, keeping them in order for installation
   - Engine harness ground bolts
3. Reposition the engine harness grounds and ground straps from the cylinder head.
   - Exhaust manifold
   - Cylinder head bolts, then discard

➡The cylinder head bolts must be replaced for installation.

   - Cylinder head. Place the head on 2 wood blocks to protect the sealing surfaces while it is removed.

To install:

➡The cylinder head should be cleaned and inspected for warpage or damage before installation.

4. Thoroughly clean the mating surfaces of the head and block. Clean the bolt holes thoroughly.

➡If a composition gasket is used, do not use sealer.

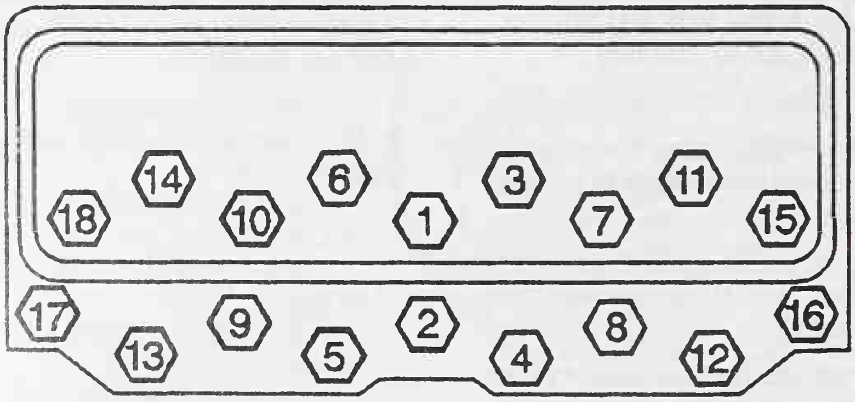
5. Align the cylinder head gasket locating marks to face up. Make sure that the gasket tabs are located of the No. 1 and 2 cylinder for proper installation.

6. Install or connect the following:
   - New cylinder head gasket
   - Cylinder head
   - Sealer to the threads of new cylinder head bolts, if not pre-applied

➡The long bolts are used in locations 1, 2, 3, 6, 7, 8, 9, 10, 11, 14, 16, and 17. The medium length bolts are used in locations 15 and 18. The short bolts are used in locations 4, 5, 12, and 13.

7. Tighten the head bolts, in sequence, in 4 stages, as follows:
   a. Step 1: 22 ft. lbs. (30 Nm).
   b. Step 2: 22 ft. lbs. (30 Nm)
   c. Step 3: Additional 120 degrees using a torque angle meter.
   d. Step 4: Torque bolt numbers. 1, 2, 3, 6, 7, 8, 9, 10, 11, 14, 16 and 17 an additional 60 degrees.
   e. Tighten bolts 15 and 18 an additional 45 degrees, and bolt numbers 4, 5, 12 and 13 an additional 30 degrees.

8. Install or connect the following:
   - Exhaust manifold



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Cylinder head bolt tightening sequence—8.1L engine

- Water crossover
- Engine harness grounds and ground strap
- Rocker arms and pushrods
- Valve cover
- Intake manifold

9. Connect the battery cable and refill the cooling system.

RIGHT SIDE

1. Drain the cooling system.
2. Remove or disconnect the following:
    - Negative battery cable
    - Intake manifold
    - Valve cover
    - Rocker arms and pushrods, keeping them in order for installation
    - Engine Coolant Temperature (ECT) sensor clip from the bracket
    - ECT sensor
    - ECT sensor bracket bolt and bracket
    - Heater inlet and outlet hoses from the hose bracket
    - Water crossover
    - Exhaust manifold
    - Cylinder head bolts, then discard

➡The cylinder head bolts must be replaced for installation.

- Cylinder head. Place the head on 2 wood blocks to protect the sealing surfaces while it is removed.

To install:

➡The cylinder head should be cleaned and inspected for warpage or damage before installation.

3. Thoroughly clean the mating surfaces of the head and block. Clean the bolt holes thoroughly.

➡If a composition gasket is used, do not use sealer.

4. Align the cylinder head gasket locating marks to face up. Make sure that the gasket tabs are located of the no. 1 and 2 cylinder for proper installation.
5. Install or connect the following:
    - New cylinder head gasket
    - Cylinder head
    - Sealer to the threads of new cylinder head bolts, if not pre-applied

➡The long bolts are used in locations 1, 2, 3, 6, 7, 8, 9, 10, 11, 14, 16, and 17. The medium length bolts are used in locations 15 and 18. The short bolts are used in locations 4, 5, 12, and 13.

6. Tighten the head bolts, in sequence, in 4 stages, as follows:
    a. Step 1: 22 ft. lbs. (30 Nm).
    b. Step 2: 22 ft. lbs. (30 Nm)
    c. Step 3: Additional 120 degrees using a torque angle meter.
    d. Step 4: Torque bolt numbers. 1, 2, 3, 6, 7, 8, 9, 10, 11, 14, 16 and 17 an additional 60 degrees.
    e. Tighten bolts 15 and 18 an additional 45 degrees, and bolt numbers 4, 5, 12 and 13 an additional 30 degrees.
7. Install or connect the following:
    - Exhaust manifold
    - Water crossover
    - Heater hose bracket and bolts. Tighten the bolts to 37 ft. lbs. (50 Nm).
    - ECT sensor bracket and bolt. Tighten to 37 ft. lbs. (50 Nm).
    - ECT sensor
    - ECT sensor clip
    - Rocker arms and pushrods
    - Valve cover
    - Intake manifold
8. Connect the battery cable and refill the cooling system.

Rocker Arms

REMOVAL & INSTALLATION

4.3L, 5.0L and 5.7L Engines

1. Remove or disconnect the following:
    - Engine cover
    - Cylinder head cover
    - Rocker arm nut. If you are only replacing the pushrod, back the nut off until you can swing the rocker out of the way.
    - Rocker arms and balls as a unit

➡Always remove each set of rocker arms (1 set per cylinder) as a unit.

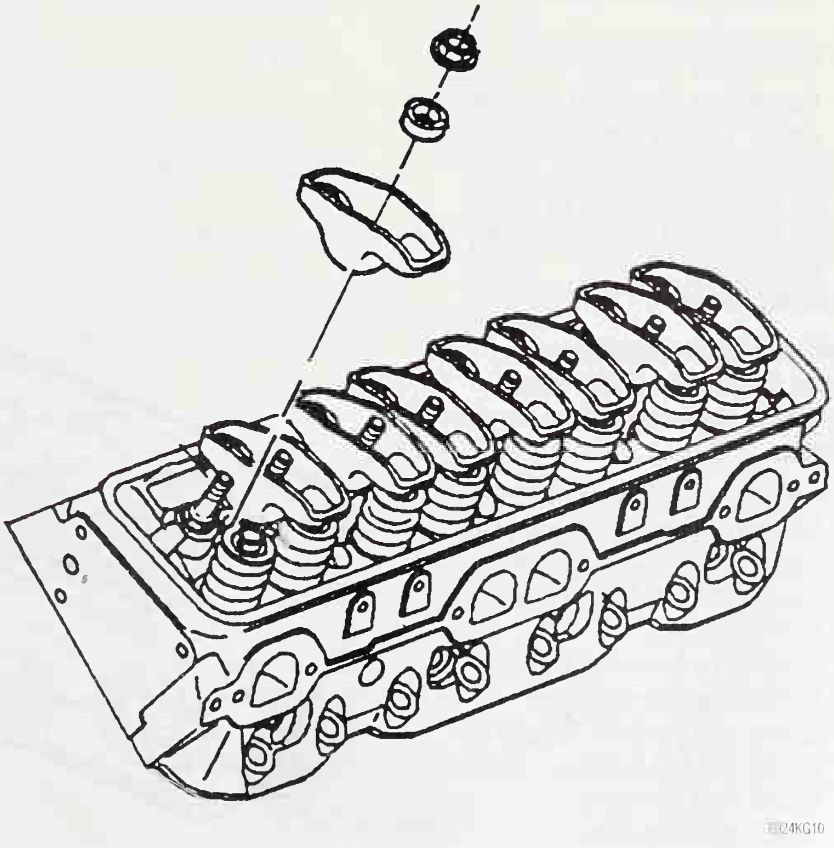
- Pushrods and pushrod guides

To install:

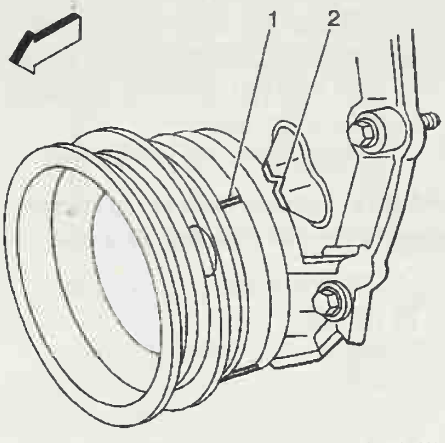
2. Install or connect the following:
    - Pushrods and their guides. Be sure that they seat properly in each lifter.
3. Position a set of rocker arms (for 1 cylinder) in the proper location.

➡Install the rocker arms for each cylinder only when the lifters are off the cam lobe and both valves are closed.

4. Coat the replacement rocker arm with Molykote® or its equivalent, and the rocker arm and pivot with SAE 90 gear oil, and install the pivots.
    - Nuts and finger tighten
5. On 4.3L engines, rotate the crankshaft balancer to position the crankshaft balancer alignment mark (1) 57-63 degrees clockwise or counterclockwise from the engine front cover alignment tab (2).
6. Tighten the rocker arm nuts to 22 ft. lbs. (30 Nm).



Exploded view to the rocker arm and related components—4.3L, 5.0L and 5.7L engines



Positioning the crankshaft balancer alignment marks—4.3L engine

7. Install the rocker arm cover.
8. Install the engine cover.

4.8L, 5.3L and 6.0L Engines

➡Do not remove the ignition coils from the valve rocker arm cover unless required. Do not remove the oil fill tube from the cover unless serice is required. If the oil fill tube has been removed from the cover, install a NEW tube during assembly.

On the right side:

1. Remove or disconnect the following:
   - Ignition coil bracket bolts from the rocker arm cover, if required
   - Ignition coil and bracket assembly from the cover
   - Valve rocker arm cover bolts
   - Valve rocker arm cover
   - Gasket from the cover. Discard the gasket. The bolt grommets may be reused if not damaged.
   - Oil fill cap from the oil fill tube
   - Oil fill tube, if required. Discard the oil fill tube.

On the left side:

➡Do not remove the Positive Crankcase Ventilation (PCV) valve grommet from the cover unless service is required.

2. Remove or disconnect the following:
   - Ignition coil bracket bolts from the rocker arm cover (if required)
   - Ignition coil and bracket assembly from the cover
   - Valve rocker arm cover bolts
   - Valve rocker arm cover
   - Gasket from the cover. Discard the gasket. The bolt grommets may be reused if not damaged.
   - Valve rocker arm bolts
   - Valve rocker arms
   - Valve rocker arm pivot support
   - Pushrods

To install:

➡Valve lash is built in. No valve adjustment is required.

3. Lubricate the valve rocker arms and pushrods with clean engine oil.
4. Lubricate the flange of the valve rocker arm bolts with clean engine oil.
5. Lubricate the flange or washer surface of the bolt that will contact the valve rocker arm.
6. Install or connect the following:
   - Valve rocker arm pivot support

➡Make sure that the pushrods seat properly to the valve lifter sockets.

   - Pushrods

➡Make sure that the pushrods seat properly to the ends of the rocker arms.

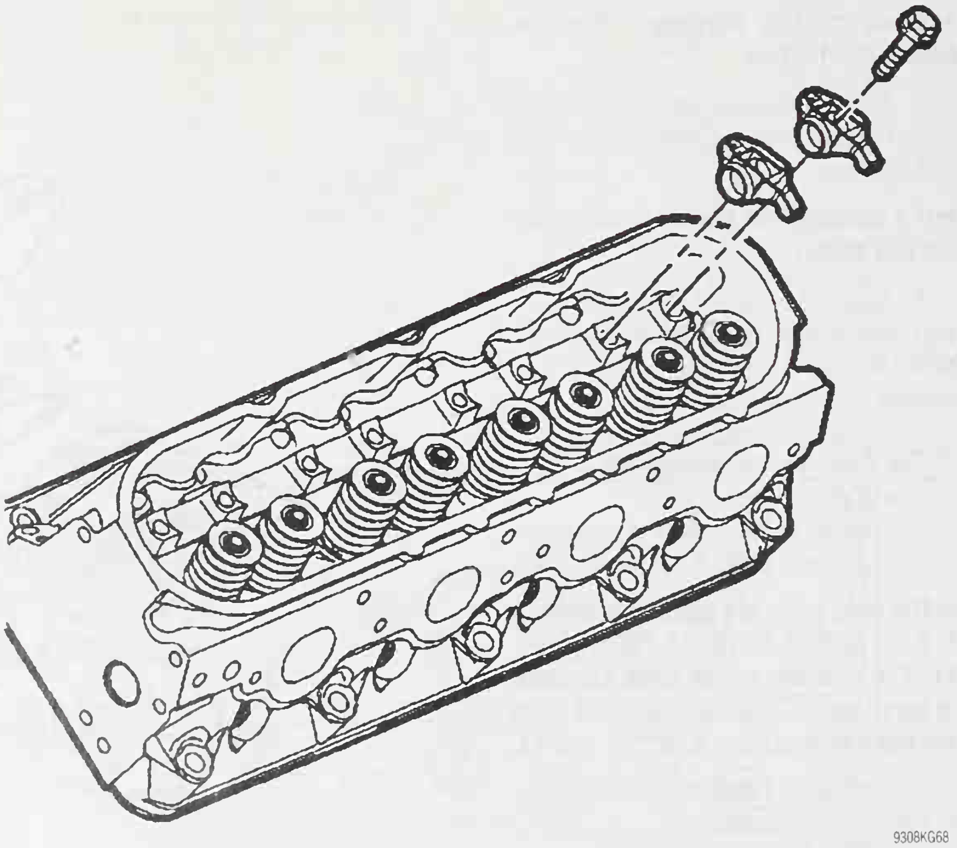
   - Rocker arms and bolts. DO NOT tighten the rocker arm bolts at this time

7. Rotate the crankshaft until number one piston is at top dead center of compression stroke. In this position, cylinder number one rocker arms will be off lobe lift, and the crankshaft sprocket key will be at the 1:30 position. If viewing from the rear of the engine, the additional crankshaft pilot hole (non-threaded) will be in the 10:30 position. The engine firing order is 1, 8, 7, 2, 6, 5, 4, 3. Cylinders 1, 3, 5 and 7 are left bank. Cylinders 2, 4, 6, and 8 are right bank.
8. With the engine in the number one firing position, tighten the following valve rocker arm bolts:
   a. Tighten exhaust valve rocker arm bolts 1, 2, 7, and 8 to 22 ft. lbs. (30 Nm).
   b. Tighten intake valve rocker arm bolts 1, 3, 4, and 5 to 22 ft. lbs. (30 Nm).
9. Rotate the crankshaft 360 degrees. Tighten the following valve rocker arm bolts:
   a. Tighten exhaust valve rocker arm bolts 3, 4, 5, and 6 to 22 ft. lbs. (30 Nm).
   b. Tighten intake valve rocker arm bolts 2, 6, 7, and 8 to 22 ft. lbs. (30 Nm).

On the right side:

➡The valve rocker arm cover bolt grommets may be reused. If the oil fill tube has been removed from the valve rocker arm cover, install a NEW oil fill tube during assembly.

10. Lubricate the O-ring seal of the NEW oil fill tube with clean engine oil.
11. Install or connect the following:
    - NEW oil fill tube into the rocker arm cover and rotate the tube clockwise until locked in the proper position
    - Oil fill cap into the tube and rotate clockwise until locked in the proper position



Rocker arm removal—4.8L, 5.3L and 6.0L engines

- NEW cover gasket into the valve rocker arm cover
- Valve rocker arm cover onto the cylinder head

12. Install the cover bolts with grommets. Tighten the valve rocker arm cover bolts to 106 inch lbs. (12 Nm).

13. Apply threadlock GM P/N 12345382 or equivalent to the threads of the bracket bolts. Install the ignition coil and bracket assembly and bolts. Tighten the ignition coil and bracket assembly studs to 106 inch lbs. (12 Nm).

On the left side:

➡DO NOT reuse the valve rocker arm cover gasket. The valve rocker arm cover bolt grommets may be reused. If the vapor vent grommet has been removed from the valve rocker arm cover, install a NEW vapor vent gourmet during assembly.

14. Install or connect the following:
    - NEW cover gasket (1) into the valve rocker arm cover
    - Valve rocker arm cover onto the cylinder head

15. Install the cover bolts with grommets. Tighten the valve rocker arm cover bolts to 106 inch lbs. (12 Nm).

16. Apply threadlock GM P/N 12345382 or equivalent to the threads of the bracket bolts. Install the ignition coils and bracket assembly and bolts. Tighten the ignition coil and bracket assembly bolts to 106 inch lbs. (12 Nm).

8.1L Engine

➡Always make sure to keep all removed valve train components in order for reassembly. They must be installed in the same position from which they were removed.

1. Remove or disconnect the following:
    - Valve (rocker arm) cover
    - Rocker arm nuts, balls and rocker arms

➡The intake pushrods are shorter than the exhaust pushrods.

- Pushrods
- Rocker arm guides and pushrod guides

2. Clean and inspect all components for damage.

To install:

3. Apply a suitable sealer to the rocker arm stud-to-cylinder head threads.

4. Install or connect the following:
    - Pushrod guides and rocker arm studs. Tighten to 37 ft. lbs. (50 Nm).
    - Pushrods

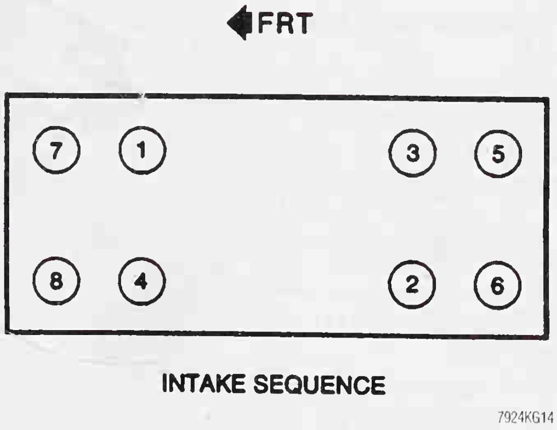
5. Coat the rocker arm and ball bearing surfaces with a suitable prelube.
    - Rocker arms, balls and nuts. Tighten the nuts slowly to 18 ft. lbs. (25 Nm) on 2002–04 models, or 26 ft. lbs. (35 Nm) on 2005–06 engines, while guiding the tips of the rocker arms over the tips of the valves.
    - Valve (rocker arm) cover

Intake Manifold

REMOVAL & INSTALLATION

4.3L Engine

1. Relieve the fuel system pressure.
2. Remove the fuel pipes/hoses.
3. Disconnect the cruise control cable from the throttle lever, if equipped.
4. Remove the cruise control cable from the accelerator control cable bracket, if equipped.
5. Remove the accelerator cable from the throttle body lever.
6. Remove the accelerator cable from the accelerator control cable bracket.
7. Disconnect the A/C compressor clutch and pressure switch connectors.
8. Remove the engine wiring harness clip from the accelerator control cable bracket.
9. Remove the accelerator control cable bracket with the cables attached, from the throttle body.
10. Reposition and secure the bracket and cables out of the way.
11. Disconnect the throttle position sensor, idle air control motor and control port injector connectors.
12. Remove the engine wiring harness clip bolt.
13. Disconnect the EVAP purge solenoid and Manifold absolute Pressure ((MAP) sensor connectors.
14. Disconnect the EVAP canister tube (1) from the purge solenoid valve.
15. Remove the engine wiring harness bracket nuts.
16. Remove the engine wiring harness bracket.
17. Remove the engine wiring harness ground nut and ground wire from the rear of the right cylinder head.
18. Remove the engine wiring harness rear bracket nut at the EVAP canister purge solenoid valve.
19. Remove the stud holding the engine wiring harness bracket.
20. Reposition the engine wiring harness with the bracket aside.
21. Remove the PCV valve hose from the valve and rocker cover.
22. Disconnect the power brake booster vacuum hose from the vacuum fitting.
23. Remove the accelerator cable bracket.
24. Remove the intake manifold upper studs.
25. Remove the front two throttle body studs.
26. Remove the upper intake manifold.
27. Remove the distributor housing and rotor, mark for reassembly.
28. Remove the radiator inlet hose from the thermostat housing.
29. Remove the drive belt.
30. Loosen the power steering (P/S) pump rear bracket nut.
31. Remove the P/S pump rear bracket front nut.
32. Remove the bolts and the nut for the P/S pump bracket.
33. Leave the A/C compressor, if equipped, and the P/S pump on the bracket.
34. Slide the P/S pump bracket forward to access the front intake manifold bolt.
35. Remove the lower intake manifold.
36. Remove and discard the intake manifold gaskets.
37. Clean and inspect the intake manifold.



Lower intake manifold bolt tightening sequence—4.3L engines

To install:

38. Clean all gasket mating surfaces thoroughly.

39. Position the new gaskets on the cylinder heads with the port blocking plates at the rear and the words **THIS SIDE UP** facing up.

40. Apply a 3⁄16 inch (5mm) bead of RTV to the front and rear sealing surfaces on the engine block. Extend the bead ½ inch (13mm) up each cylinder head to retain the gasket.

41. Carefully position the lower intake manifold onto the engine.

42. Apply GM 1052080 or equivalent sealer to the lower intake manifold bolts

43. Torque the bolts using 3 steps in the sequence shown:
    a. Step 1: 24 inch lbs. (3 Nm).
    b. Step 2: 108 inch lbs. (12 Nm).
    c. Step 3: 11 ft. lbs. (15 Nm).

44. Slide the P/S pump bracket rearward.

45. Install the bolts and the nut for the P/S pump bracket.

46. Install the P/S pump rear bracket front nut.

47. Tighten the P/S pump rear bracket nut.

48. Install the drive belt.

49. Install the upper radiator and bypass hose to the thermostat housing.

50. Install the distributor housing and rotor.

51. Position the upper intake manifold gasket on the lower manifold.

52. Install the upper intake manifold. Torque the bolts and studs to 88 inch lbs. (10 Nm).

53. Install the accelerator cable bracket.

54. Disconnect the power brake booster vacuum hose from the vacuum fitting.

55. Install the PCV valve hose from the valve and rocker cover.

56. Reposition the engine wiring harness with the bracket aside.

57. Install the stud holding the engine wiring harness bracket.

58. Install the engine wiring harness rear bracket nut at the EVAP canister purge solenoid valve.

59. Install the engine wiring harness ground nut and ground wire to the rear of the right cylinder head.

60. Install the engine wiring harness bracket.

61. Install the engine wiring harness bracket nuts.

62. Connect the EVAP canister tube (1) from the purge solenoid valve.

63. Connect the EVAP purge solenoid and Manifold absolute Pressure ((MAP)) sensor connectors.

64. Install the engine wiring harness clip bolt.

65. Connect the throttle position sensor, idle air control motor and control port injector connectors.

66. Install the accelerator control cable bracket with the cables attached, to the throttle body.

67. Install the engine wiring harness clip to the accelerator control cable bracket.

68. Connect the A/C compressor clutch and pressure switch connectors.

69. Install the accelerator cable to the accelerator control cable bracket.

70. Install the accelerator cable to the throttle body lever.

71. Install the cruise control cable to the accelerator control cable bracket, if equipped.

72. Connect the cruise control cable to the throttle lever, if equipped.

73. Connect the negative battery cable.

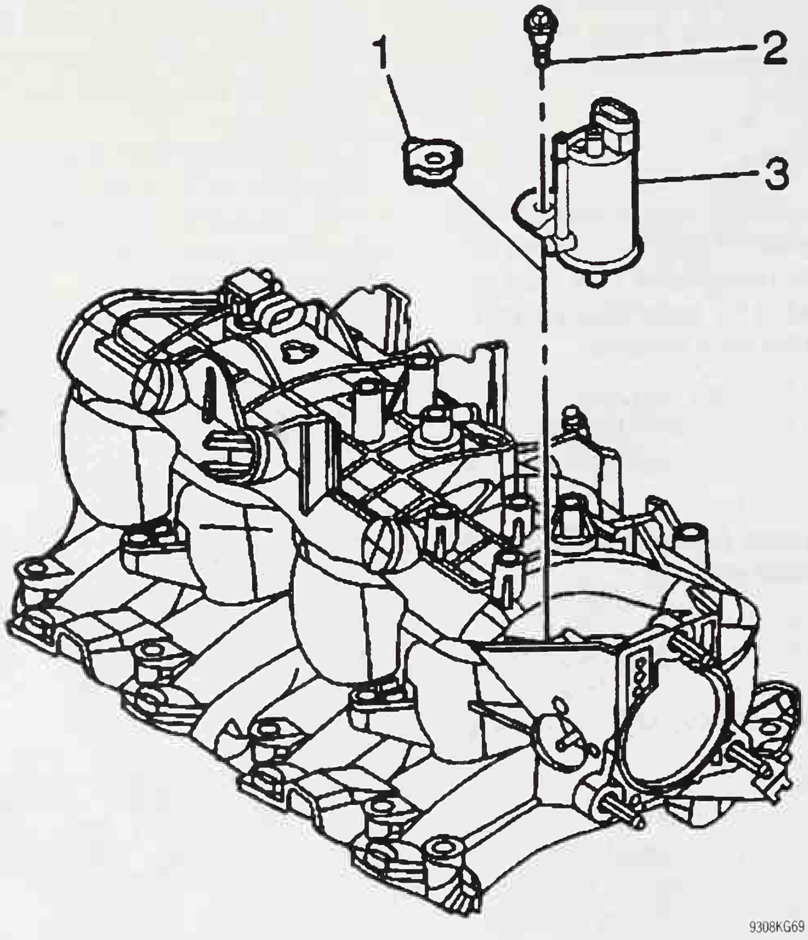
74. Refill and bleed the cooling system.

75. Pressurize the fuel system and check for leaks.

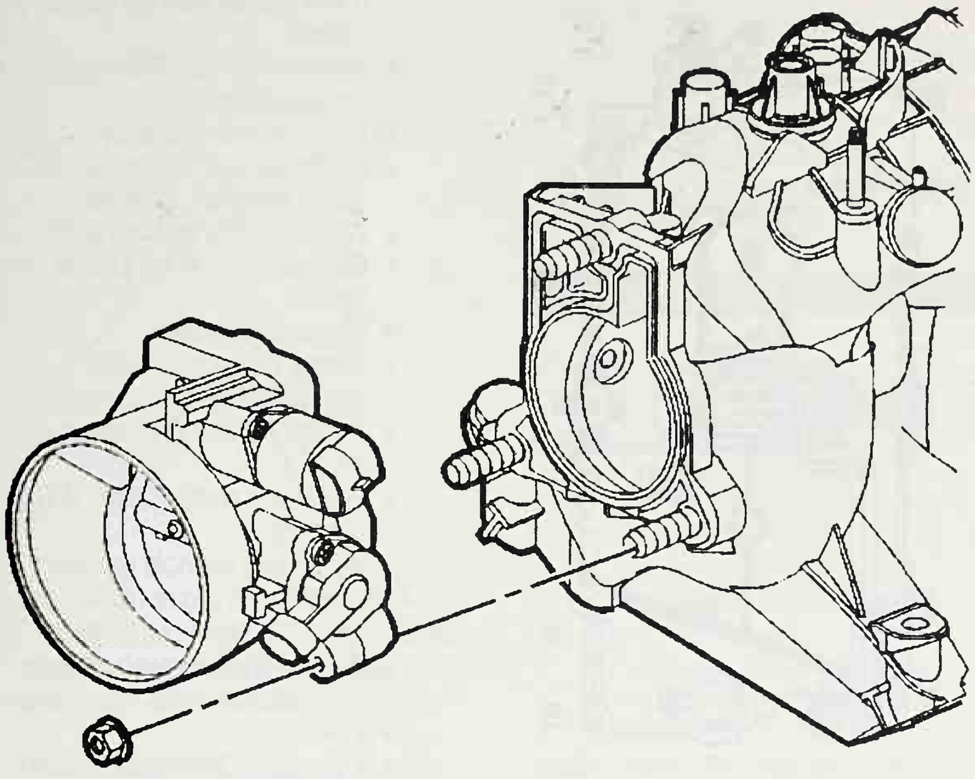
4.8L, 5.3L and 6.0L Engines

➡The intake manifold, throttle body, fuel injection rail, and fuel injectors may be removed as an assembly. If not servicing the individual components, remove the manifold as a complete assembly.

1. Remove or disconnect the following:
    - Positive Crankcase Ventilation (PCV) hose and valve
    - Manifold Absolute Pressure (MAP) sensor, if required
    - Engine coolant air bleed clamp and hose from the throttle body
    - Knock sensor connector.
    - Accelerator control cable bracket and bolts, if required
    - Fuel rail with injectors
    - EVAP solenoid, bolt, and isolator
    - Intake manifold bolts
    - Intake manifold with gaskets
    - Intake manifold-to-cylinder head gaskets from the manifold. Discard the intake manifold gaskets.
    - Throttle body and gasket
2. Clean the intake manifold in solvent.
3. Dry the intake manifold with compressed air.
4. Inspect the throttle body and wire harness studs and stud inserts for looseness or damaged threads.
5. Inspect the fuel rail bolt inserts for looseness or damaged threads.



EVAP solenoid removal—4.8L, 5.3L and 6.0L engines



Throttle body removal—4.8L, 5.3L and 6.0L engines

6. Inspect the intake manifold vacuum passages for debris or restrictions.

7. Inspect for damaged or broken vacuum fittings, damaged MAP sensor mounting bore, or broken MAP sensor retaining tabs.

8. Inspect the composite intake manifold assembly for cracks or other damage.

9. Inspect the areas between the intake runners. Inspect all the gasket sealing surfaces for damage.

10. Inspect the fuel injector bores for excessive scoring or damage. Inspect the intake manifold cylinder head deck for warpage.

11. Locate a straight edge across the intake manifold cylinder head deck surface. Position the straight edge across a minimum of two runner port openings.

12. Insert a feeler gauge between the intake manifold and the straight edge. A intake manifold with warpage in excess of 0.118 in. (3mm) over a 7.87 in. (200mm) area is warped and should be replaced.

To install:

13. Install or connect the following:
    - MAP sensor
    - EVAP solenoid, bolt, and isolator. Tighten the bolt to 89 inch lbs. (10 Nm).
    - NEW intake manifold-to-cylinder head gaskets
    - Intake manifold

14. Apply a 0.20 in. (5mm) band of threadlock GM P/N 12345382 or equivalent to the threads of the intake manifold bolts.
    - Intake manifold bolts. Tighten intake manifold bolts first pass in sequence to 44 inch lbs. (5 Nm). Tighten intake manifold bolts final pass in sequence to 89 inch lbs. (10 Nm).
    - PCV valve and hose
    - Coolant air bleed hose and clamp onto the throttle body
    - Accelerator control cable bracket and bolts. Tighten the bolts to 89 inch lbs. (10 Nm).

5.0L and 5.7L Engines

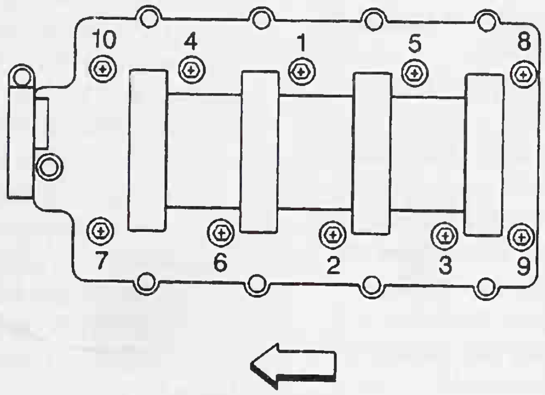
1. Remove or disconnect the following:
    - Negative battery cable
    - Engine cover
    - Air cleaner intake duct
    - Coolant reservoir
    - Wiring harness connectors and brackets
    - Throttle linkage and bracket from the upper intake manifold
    - Cruise control cable, if equipped
    - Fuel lines and the bracket from the rear of the intake manifold
    - Positive Crankcase Ventilation (PCV) valve and hoses
    - Ignition coil and bracket
    - Purge solenoid and bracket

➡Note the location of the manifold bolts and studs before removal for reassembly in their original positions.

- Intake manifold bolts and studs
- Upper intake manifold

2. Clean the old gasket residue from both mating surfaces.
    - Distributor
    - Upper radiator hose from the thermostat housing
    - Heater hose from the lower intake manifold
    - Coolant bypass hose
    - Exhaust Gas Recirculation (EGR) valve
    - Fuel pressure and return lines from the lower intake manifold
    - Wiring harnesses and brackets from the lower manifold
    - Left side valve cover
    - Transmission oil level indicator and tube, if equipped
    - EGR tube, clamp and bolt
    - Air conditioning compressor and bracket, but do not disconnect the lines

3. Loosen the compressor mounting bracket and slide it forward, but do not remove it.
    - Power brake vacuum tube
    - Lower intake manifold bolts and lower intake manifold



Lower intake manifold bolt tightening sequence—4.8L, 5.3L and 6.0L engines

To install:

4. Clean all gasket surfaces completely.
5. Install the intake manifold gaskets with the port blocking plates facing the rear. Factory gaskets should have the words **This Side Up** visible.
6. Apply gasket sealer to the front and rear sealing surfaces of the engine block. Extend the sealer approximately ½ inch (13mm) onto the heads.
7. Install the lower intake manifold.
8. Apply sealer to the lower intake manifold bolts prior to installation.
9. On the 5.0L and 5.7L engines, install the bolts and torque in sequence as follows:
    a. Step 1: 71 inch lbs. (8 Nm).
    b. Step 2: 106 inch lbs. (12 Nm).
    c. Step 3: 11 ft. lbs. (15 Nm).
10. Install or connect the following:
    - Power brake vacuum tube
    - PCV valve and hose
    - EGR tube, clamp and bolt
    - Transmission oil level indicator and tube, if equipped
    - Left side valve cover
    - Wiring harnesses and brackets to the lower manifold
    - Fuel pressure and return lines to the lower intake manifold
    - EGR valve
    - Coolant bypass hose
    - Heater hose to the lower intake manifold
    - Upper radiator hose to the thermostat housing
    - Air conditioning compressor and bracket
    - Distributor
    - Upper intake manifold gasket
    - Upper intake manifold

⁂ WARNING

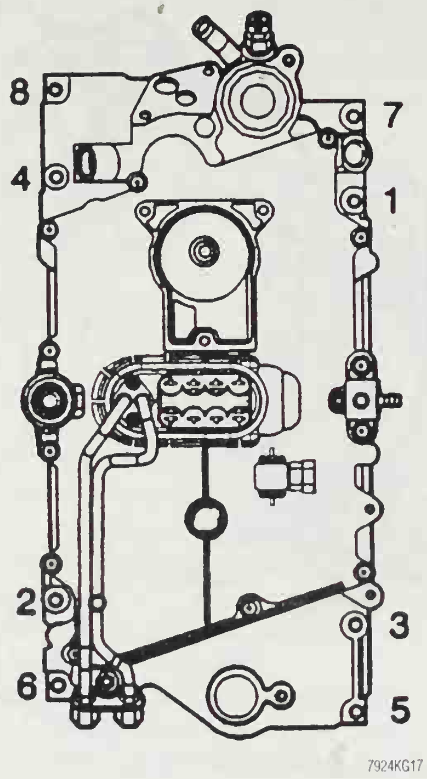
When installing the upper intake manifold be careful not to pinch the injector wires between the upper and lower intake manifolds.

- Upper intake manifold mounting bolts/studs, torque in a crisscross pattern as follows:

a. Step 1: Torque the bolts/studs to 44 inch lbs. (5 Nm).

b. Step 2: Torque the bolts/studs to 89 inch lbs. (10 Nm).

- Purge solenoid and bracket
- Fuel lines and the bracket at the rear of the intake manifold
- Ignition coil and bracket
- Throttle linkage and bracket to the upper intake manifold
- Throttle linkage cable



Lower intake manifold bolt tightening sequence—5.0L and 5.7L engines

- Cruise control cable, if equipped
- Wiring harness connectors and brackets
- Air cleaner intake duct
- Coolant recovery reservoir and the engine cover
- Negative battery cable

11. Start the vehicle and verify that there are no leaks.

8.1L Engine

➡The intake manifold, throttle body, fuel rail and injectors can be removed as an assembly. If you do not need to service these components individually, remove the manifold as a complete assembly.

1. Relieve the fuel system pressure and drain the cooling system.
2. Remove or disconnect the following:
    - Air cleaner outlet duct
    - Intake manifold sight shield
    - Fuel feed and return pipes
    - Engine harness clips from the studs on the front of the dash
    - Engine harness clip from the wheelhouse splash shield
    - Pressure cycling switch, surge tank switch and Mass Air Flow (MAF) electrical connectors
3. Reposition the engine harness to the top of the engine
    - Connector Position Assurance (CPA) retainer from the ignition coil harness
    - Manifold Absolute Pressure (MAP) sensor connector
    - Ignition coil connector(s)
    - Engine Coolant Temperature (ECT) sensor electrical connector
    - Engine harness bolt and studs
    - CPA retainer from the ignition coil harness
    - Alternator connector
    - Injector harness connector
    - Ignition coil harness connector
    - Throttle Position (TP) sensor connector
    - Electronic Throttle Control (ETC) connector
    - Purge valve solenoid connector
4. Reposition the engine harness to the drivers side of the engine compartment.
    - Bypass valve vacuum hose from the intake manifold
    - EVAP tubes
    - Exhaust Gas Recirculation (EGR) valve electrical connector
    - EGR pipe bolts from the EGR adapter. Reposition the EGR pipe
    - EGR valve pipe gasket and discard
    - Secondary Air Injection (AIR) pipe nut from the fuel rail stud, if equipped
    - Fuel pressure regulator vacuum hose
    - Fuel rail studs and fuel rail, ONLY if replacing the manifold
    - Intake manifold bolts

⁂ WARNING

Do NOT try to remove the intake manifold by prying under the sealing surfaces.

- Intake manifold
- Intake manifold side gaskets and end seals and discard

➡The splash shield is reusable and secured using a snap-in fit. Do not distort the shield during removal.

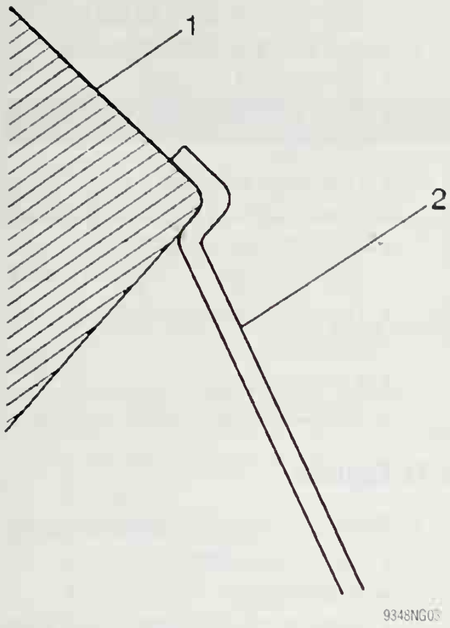
- Splash shield

To install:

5. Clean all gasket surfaces completely.
6. Install or connect the following:
    - Splash shield. Make sure the shield fits properly between the cylinder head.

➡Make sure the manifold gasket tabs align with the hole in the head gasket.

- New intake manifold end seals
- New intake manifold side gaskets onto the heads. Make sure the

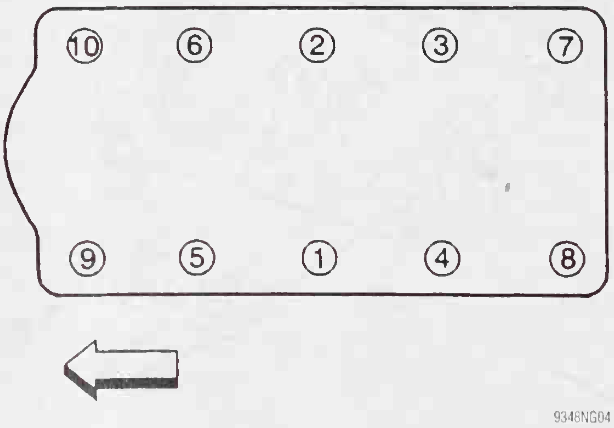


Make sure that the splash shield snap fits between the cylinder heads

stamped **This Side Up** is showing.

- Intake manifold to the block
- Apply a suitable thread locking material to at least 8 threads of the intake manifold bolts

7. On 2002–04 models, install the intake manifold bolts and tighten, in the sequence shown, in 4 passes:
   a. 1st pass: 44 inch lbs. (5 Nm).
   b. 2nd pass: 44 inch lbs. (5 Nm).
   Check the manifold joints for shifting and fix as necessary.
   c. 3rd pass: 89 inch lbs. (10 Nm).
   d. 4th pass: 106 inch lbs. (12 Nm).
8. On 2005–06 models, install the intake manifold bolts and tighten, in the sequence shown, in 4 passes:
   a. 1st pass: 44 inch lbs. (5 Nm).
   b. 2nd pass: 71 inch lbs. (8 Nm).
   Check the manifold joints for shifting and fix as necessary.
   c. 3rd pass: 106 inch lbs. (12 Nm).
   d. 4th pass: 11 ft. lbs. (15 Nm).
9. Install the remaining components in the reverse order of the removal procedure.
10. Fill the cooling system, then connect the negative battery cable
11. Start the vehicle and verify that there are no leaks.



Intake manifold bolt tightening sequence—8.1L engine

Exhaust Manifold

REMOVAL & INSTALLATION

4.3L Engine

1. Remove or disconnect the following:
   - Negative battery cable
   - Engine cover, if equipped
   - Exhaust pipe from the exhaust manifold
   - Spark plug wires from the plugs and the retaining clips
   - Heat shields
   a. Remove the spark plugs, dipstick tube and wiring, if necessary.
2. Unbend the exhaust manifold bolt lock tangs.
3. Remove or disconnect the following:
   - Exhaust manifold retaining bolts, washers and tab washers
   - Exhaust manifold
   - Old gaskets and discard

To install:

4. Clean the gasket mounting surfaces.
5. Inspect the exhaust manifold for distortion, cracks or damage; replace if necessary.
6. Install or connect the following:
   - Exhaust manifold to the cylinder using a new gasket.
7. Tighten the exhaust manifold bolts and stud on the first pass to 11 ft. lbs. (5 Nm).
8. Tighten the exhaust manifold bolts and stud on the final pass to 22 ft. lbs. (30 Nm).

➡Once the bolts are tightened, bend the tabs on the washers back over the heads of all bolts in order to lock them in position.

- Spark plugs
- Dipstick tube
- Spark plug wires to the retainer clips and plugs
- Exhaust pipe to the manifold
- Engine cover, on van models
- Negative battery cable

4.8L, 5.3L and 6.0L Engines

1. Remove or disconnect the following:
   - Spark plug wires from the spark plugs

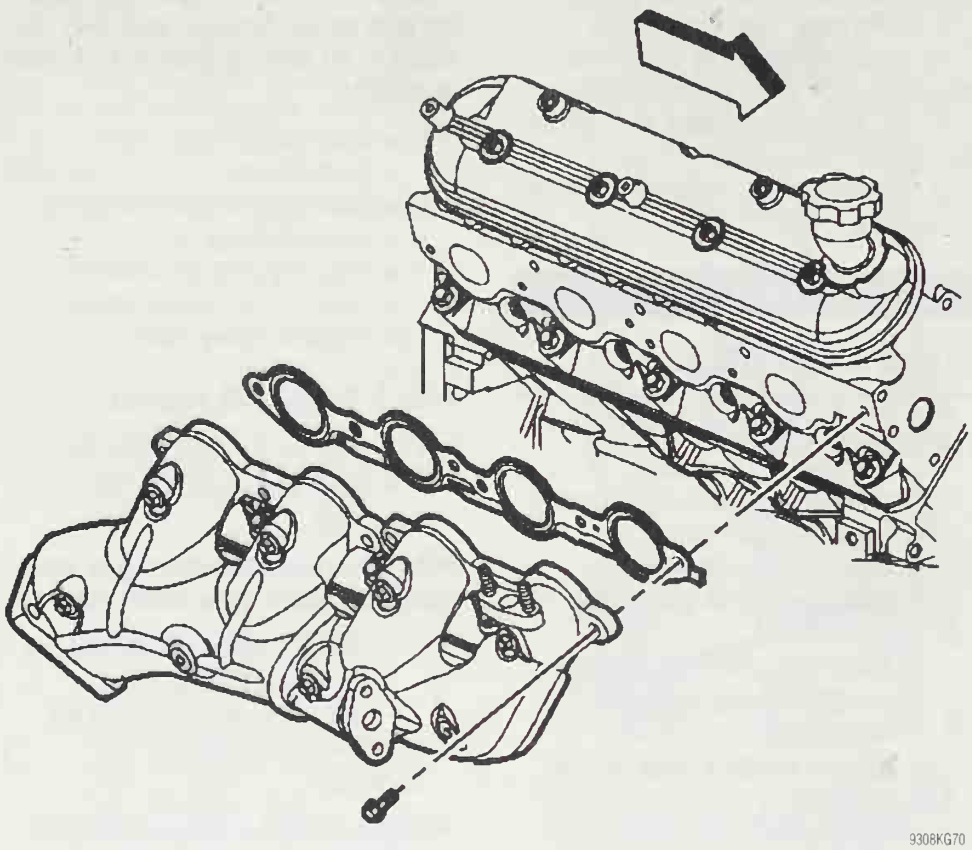
➡Do not remove the spark plug wires from the ignition coils unless required.

- Exhaust manifold, bolts, and gasket. Discard the gasket.
- Heat shield and bolts from the manifold, if required

To install:

➡Do not reuse the exhaust manifold-to-cylinder head gaskets. Upon installation of the exhaust manifold, install a NEW gasket. A improperly installed gasket or leaking exhaust system may effect On-Board Diagnostics (OBD) II system performance.

2. Clean the exhaust manifold and heat shield in solvent. Dry the exhaust manifold with compressed air.
3. Use a straight edge and a feeler gauge and measure the exhaust manifold cylinder head deck for warpage. An exhaust manifold deck with warpage in excess of 0.01 in. (0.25mm) within the two front or two rear runners or 0.02 in. (0.5mm) overall, may cause an exhaust leak and may effect OBD II system performance. Exhaust manifolds not within specifications must be replaced.
4. Apply a 0.2 in. (5mm) wide band of threadlock GM P/N 12345493 or equivalent to the threads of the exhaust manifold bolts.
5. Install the exhaust manifold gasket and exhaust manifold
6. Install the exhaust manifold bolts and tighten, beginning with the center two bolts. Alternate from side-to-side, and work toward the outside bolts.
   a. Tighten the exhaust manifold bolts first pass to 11 ft. lbs. (15 Nm).
   b. Tighten the exhaust manifold bolts final pass to 18 ft. lbs. (25 Nm). Using a flat punch, bend over the exposed edge of the exhaust manifold gasket at the front of the right cylinder head.



Right exhaust manifold removal—4.8L, 5.3L and 6.0L; left side similar

7. Install or connect the following:
   - Heat shield and bolts and tighten to 80 inch lbs. (9 Nm)
   - Spark plug wires

5.0L and 5.7L Engines

1. Remove or disconnect the following:
   - Negative battery cable
   - Engine cover
   - Air cleaner, if needed
   - Exhaust pipe at the manifold
   - Oxygen Sensor (O_2S) wiring, if equipped
   - AIR hose at the check valve
   - Exhaust Gas Recirculation (EGR) valve, inlet pipe
   - Heat stove pipe and the dipstick tube bracket, if working on the right side of the engine
   - Power steering pump rear bracket at the manifold, if removing the left side manifold
   - Loosen the alternator and remove the lower bracket, if necessary
   - Air conditioner compressor rear bracket and the diverter valve and bracket, if needed

➡ On models with air conditioning, it may be necessary to remove the compressor, do not disconnect the compressor lines.

   - Manifold bolts and the manifold(s) Some models have lock tabs on the front and rear manifold bolts which must be removed before removing the bolts.

To install:

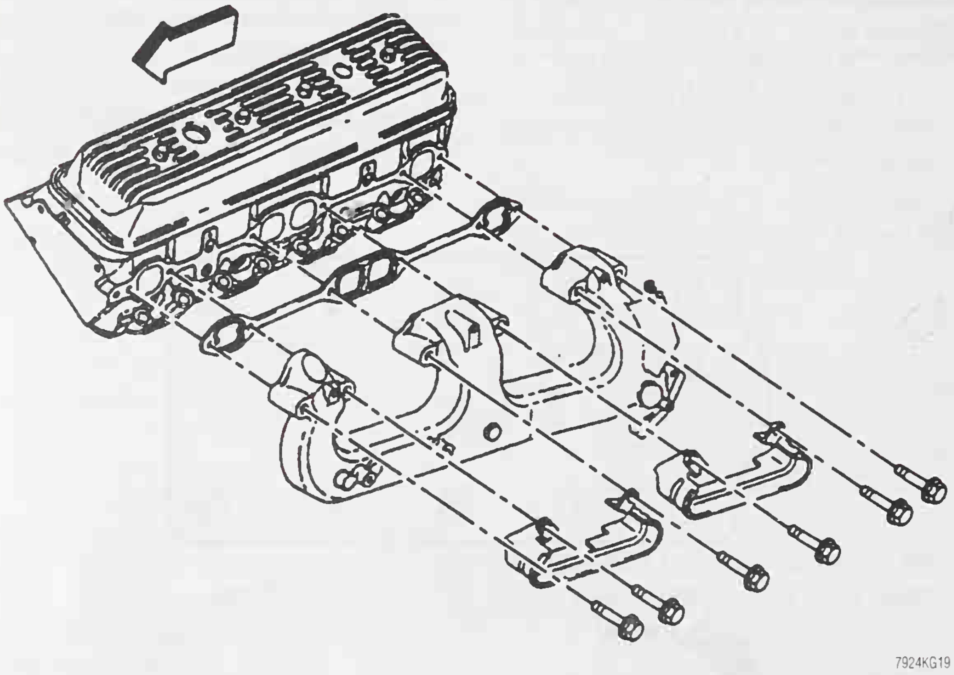
2. Clean gasket surfaces, and inspect manifold for cracks replace as necessary.
3. Install the manifold and torque it in the following steps:
   a. Step 1: 15 ft. lbs. (20 Nm).
   b. Step 2: 22 ft. lbs. (30 Nm).
4. Install or connect the following:
   - Alternator, if removed
   - Air conditioning compressor, if removed
   - Diverter, if removed
   - Power steering brackets, if removed
   - Dipstick tube on right side
   - EGR inlet pipe
   - Oxygen sensor connector, if equipped
   - Exhaust pipes
   - Negative battery cable

8.1L Engines

1. Remove or disconnect the following:
   - Spark plug wires
   - Spark plugs
   - Exhaust manifold heat shield bolts and shield
   - Exhaust manifold bolt and nuts
   - Exhaust manifold
   - Exhaust manifold gasket and discard

To install:

2. Clean the mating surfaces and the retainer threads.
3. Install or connect the following:
   - New exhaust manifold gasket
   - Exhaust manifold
   - Exhaust manifold bolt and nuts. Tighten the bolt to 26 ft. lbs. (35 Nm) and the nuts to 12 ft. lbs. (16 Nm).
   - If removed, tighten the studs to 15 ft. lbs. (20 Nm).
   - Heat shield. Tighten the retaining



Exploded view of the left exhaust manifold, the right side is similar—5.0L and 5.7L engines bolts and nuts to 18 ft. lbs. (25 Nm).

- Spark plugs and plug wires

Camshaft and Valve Lifters

REMOVAL & INSTALLATION

4.3L Engines

1. Properly relieve the fuel system pressure.
2. Drain the engine cooling system.
3. Remove or disconnect the following:
    - Negative battery cable
    - Radiator
    - Cooling fan
    - Water pump
    - Rocker arm covers from the engine
    - Intake manifold assembly
    - Rocker arms, pushrods and lifters
    - Crankshaft pulley and hub
    - Engine front cover
4. Align the timing marks on the crankshaft and camshaft sprockets.
    - Camshaft sprocket and timing chain
    - Balance shaft drive gear, if equipped
    - Camshaft thrust plate

➡Install the sprocket bolts or longer bolts of the same thread into the end of the camshaft as a handle.

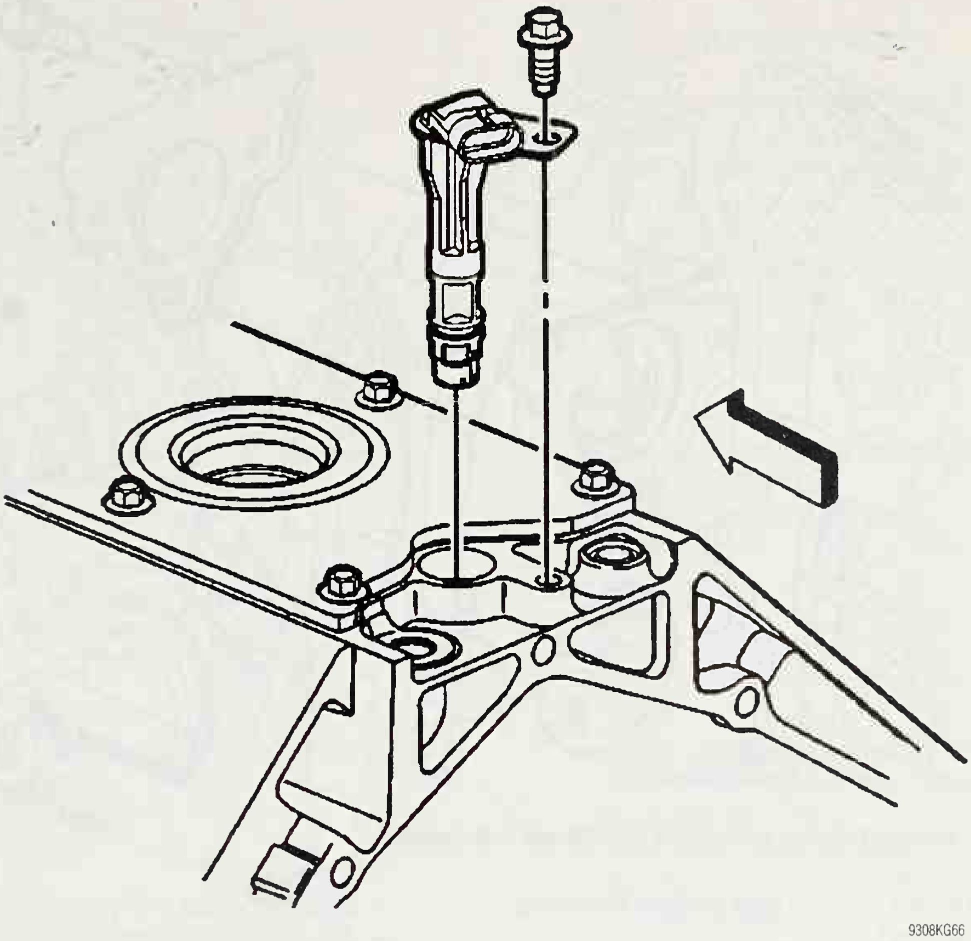
- Camshaft

To install:

5. Lubricate the camshaft journals with clean engine oil or a suitable pre-lube.
6. Install or connect the following:
    - Camshaft
    - Camshaft thrust plate
    - Balance shaft drive gear, if equipped
    - Timing chain and camshaft sprocket
    - Engine front cover
    - Crankshaft pulley and hub
    - Valve lifters
    - Pushrods and rocker arms, properly adjust the valve clearance
    - Intake manifold assembly
    - Rocker arm covers to the engine
    - Radiator to the vehicle
    - Negative battery cable
7. Refill the engine cooling system.

4.8L, 5.3L and 6.0L Engines

1. Raise the hood to the servicing position and secure it. Move the hood hinge bolt to hold the hood in the servicing position.



Camshaft sensor removal—4.8L, 5.3L and 6.0L engines

2. Remove or disconnect the following:
    - Battery negative cable
    - Coolant
    - Upper and lower radiator hoses from the engine
    - Air cleaner duct from the engine
    - A/C condenser mounting bolts, if equipped
    - Radiator support and radiator
    - Engine cooling fan
    - Drive belt
    - A/C drive belt, if equipped
    - Engine sight shield
    - Electrical wiring harness from the thermostat housing
    - Water pump
3. Raise the vehicle.
    - Starter motor
    - Right side closeout cover and bolt
    - Crankshaft balancer
    - Engine oil pan
    - Engine front cover
    - Cylinder heads from the engine
    - Valve lifters from the engine
4. Align the timing marks on the camshaft and crankshaft sprockets. Make sure that the number 1 piston is in the firing position.
    - Camshaft sprocket
    - Camshaft sensor bolt and sensor
    - Camshaft retainer bolts and retainer

➡All camshaft journals are the same diameter, so care must be used in removing or installing the camshaft to avoid damage to the camshaft bearings.

5. Install the three M8-1.25 x 100 mm bolts in the camshaft front bolt holes. Using the bolts as a handle, carefully rotate and pull the camshaft out of the engine block. Remove the bolts from the front of the camshaft.
6. Clean and inspect all sealing surfaces.

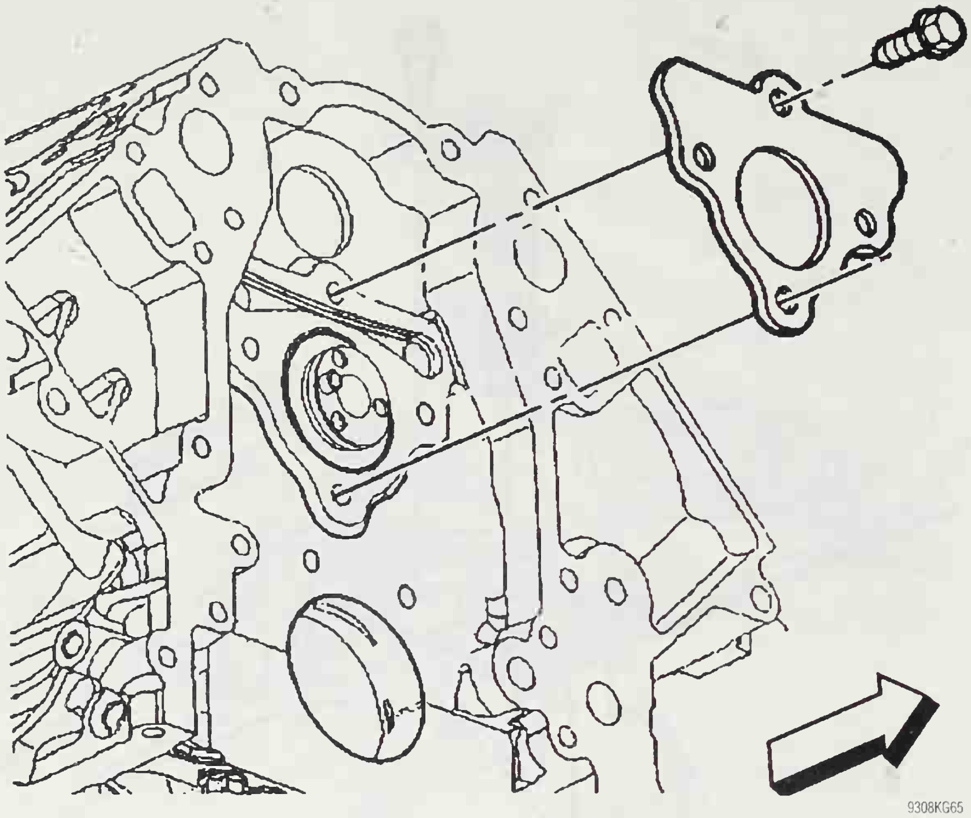
To install:

➡If camshaft replacement is required, the valve lifters must also be replaced.

7. Lubricate the camshaft journals and the bearings with clean engine oil. Install three M8-1.25 x 100 mm (M8-1.25 x 4.0 in) bolts into the camshaft front bolt holes.

➡All camshaft journals are the same diameter, so care must be used in removing or installing the camshaft to avoid damage to the camshaft bearings.

8. Using the bolts as a handle, carefully install the camshaft into the engine block.



Camshaft retainer removal—4.8L, 5.3L and 6.0L engines

Remove the three bolts from the front of the camshaft.

➡Install the retainer plate with the sealing gasket facing the engine block. The gasket surface on the engine block should be clean and free of dirt or debris.

9. Install or connect the following:
    - Camshaft retainer and the bolts. Tighten the camshaft retainer bolts to 18 ft. lbs. (25 Nm).

10. Inspect the camshaft sensor O-ring seal. If the O-ring seal is not cut or damaged, it may be reused. Lubricate the O-ring seal with clean engine oil.
    - Camshaft sensor and bolt. Tighten the bolt to 18 ft. lbs. (25 Nm).
    - Camshaft sprocket and timing chain
    - Valve lifters
    - Cylinder heads
    - Engine front cover to the engine
    - Oil pan
    - Right side closeout cover
    - Starter motor
    - Crankshaft balancer to the crankshaft
    - Water pump
    - Electrical wiring harness to the thermostat housing
    - A/C drive belt, if equipped
    - Drive belt
    - Engine sight shield
    - Radiator support and radiator
    - A/C condenser mounting bolts
    - Engine cooling fan
    - Air cleaner duct
    - Negative battery cable

5.0L and 5.7L Engines

1. Drain the cooling system.
2. Properly relieve the fuel system pressure.
3. Remove or disconnect the following:
    - Engine cover, on van models
    - Air cleaner
    - Grille and center support, on van models
    - Air conditioning condenser and swing the condenser forward from its mounting, if equipped.
    - Fan, the shroud and the radiator
    - Valve covers
    - Water pump assembly
4. Align the timing marks and remove the torsional damper.
    - Timing chain cover
    - Electrical and vacuum connections at the intake manifold
    - Distributor assembly, mark the distributor rotor-to-housing location
    - Intake manifold, pushrods and hydraulic lifters
    - Camshaft sprocket bolts
    - Camshaft sprocket and timing chain
    - Crankshaft sprocket, as required
    - Front engine mount through-bolts and raise the engine to gain sufficient clearance for camshaft removal, as required
5. Install 2 or 3 $\frac{5}{16}$–18 bolts 4–5 in. (102–127mm) long into the camshaft threaded holes.
    - Camshaft

➡Inspect the shaft for signs of excessive wear or damage.

To install:

➡Liberally coat camshaft and bearing with heavy engine oil or engine assembly lubricant.

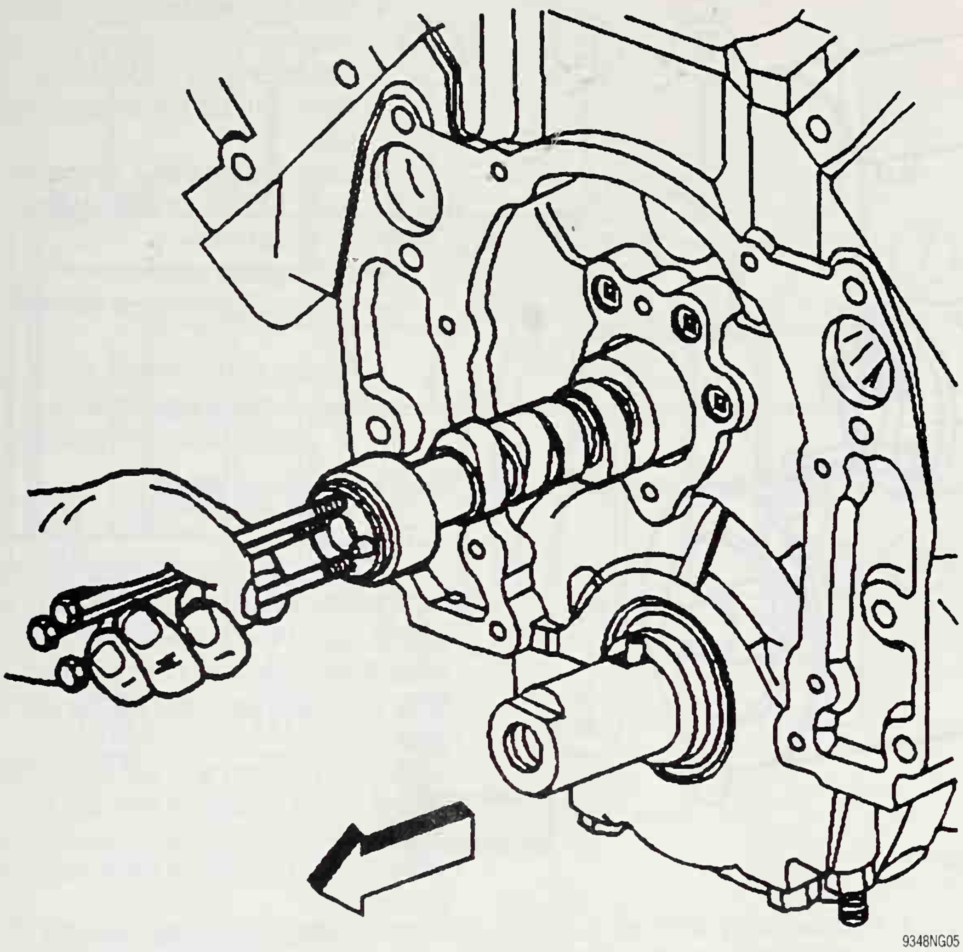
6. Install or connect the following:
    - Camshaft, align the timing marks on the camshaft and crankshaft gears
    - Engine mount through-bolts
    - Camshaft sprocket and chain. Torque the bolts to 18 ft. lbs. (25 Nm).
    - Hydraulic lifters and pushrods
    - Distributor assembly
    - Timing chain cover
    - Torsional damper
    - Water pump
    - Valve covers
    - Fan, the shroud and radiator
    - Air conditioning condenser, if equipped
    - Grille and center support, on van models
    - Air cleaner
    - Engine cover, on van models
    - Negative battery cable
7. Refill the cooling system.

8.1L Engines

1. Properly discharge the air conditioning system.
2. Remove or disconnect the following:
    - Grille
    - A/C condenser
    - Intake manifold
    - Rocker arms and pushrods
    - Valve lifter guide retainer bolts and retainer
    - Valve lifter guides, keeping them in proper order for reassembly
    - Valve lifters

➡If any lifters are stuck in their bores, use a suitable valve lifter to remove them.

- Timing chain and sprocket
- Camshaft retaining bolts
- Camshaft retainer



Use the 3 bolts as a handle to carefully remove and install the camshaft—8.1L engine shown

⁂ WARNING

All of the cam journals are the same size so be very careful when removing and installing the camshaft that you do not damage the bearings.

3. Install three 8-1.25 x 100mm bolts in the holes in the front of the camshaft and carefully pull the camshaft from the block.
4. Remove the bolts from the front of the camshaft.
5. Clean and inspect the camshaft for damage.

To install:

6. Liberally coat camshaft and bearings with heavy engine oil or engine assembly lubricant.
7. Install the camshaft, using the 3 bolts threaded into the camshaft bolt holes as a handle, then remove the bolts.
8. Install or connect the following:
   - Camshaft retainer and bolts. Tighten to 106 inch lbs. (12 Nm).

➡If a new camshaft is installed, you MUST install new valve lifters.

   - Timing chain and sprocket
   - Valve lifters
   - Valve lifter guides over the flats on the lifters. Make sure the rollers of the lifters are properly aligned with the cam lobes.
   - Valve lifter guide retainer. Tighten the bolts to 18 ft. lbs. (25 Nm).
   - Rocker arms and pushrods
   - Intake manifold
   - A/C condenser
   - Grille
9. Recharge the A/C system.

Valve Lash

ADJUSTMENT

All engines use hydraulic lifters, which require no periodic adjustment.

Starter Motor

REMOVAL & INSTALLATION

4.3L and 5.0L Engines

1. Remove or disconnect the following:
   - Negative battery cable
   - Bracket and shield
   - Wires
   - Mounting bolts and shims
   - Starter

To install:

2. Install or connect the following:
   - Starter
   - Mounting bolts and shim. Torque the bolts to 33 ft lbs. (45 Nm).
   - Wires. Torque battery wire nut to 89 inch lbs. (10 Nm) and ignition nut to 18 inch lbs. (2 Nm).
   - Bracket and shield. Torque the nuts to 53 inch lbs. (6 Nm).
   - Negative battery cable

5.7L Engines

1. Remove or disconnect the following:
   - Negative battery cable
   - Mounting bolts and shims
   - Wires
   - Heat shield
   - Starter

To install:

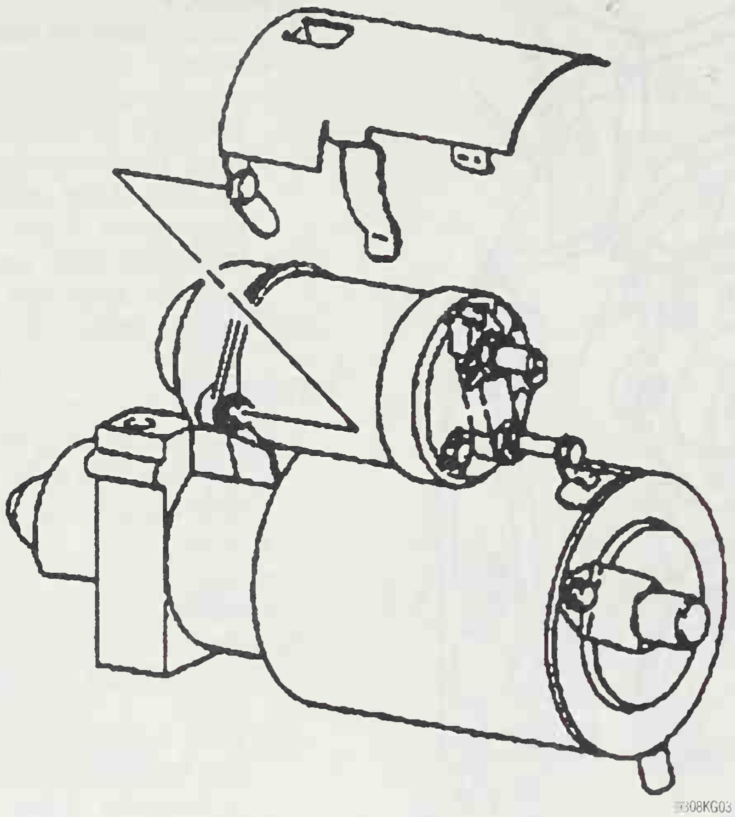
2. Install or connect the following:
   - Starter
   - Wires. Torque battery wire nut to 89 inch lbs. (10 Nm), and ignition nut to 18 inch lbs. (2 Nm).
   - Heat shield. Torque the bolts to 53 inch lbs. (6 Nm) and the nuts to 35 inch lbs. (3 Nm).
   - Mounting bolts and shim. Torque the bolts to 33 ft lbs. (45 Nm).
   - Negative battery cable

4.8L, 5.3L and 6.0L Engines

1. Disconnect the negative battery cable.
2. Raise and support the vehicle.
3. Remove or disconnect the following:
   - Protective shields (as necessary)
   - Starter solenoid shield
   - Starter-to-transmission close out cover bolt
   - Engine oil level sensor connection
4. Slide the starter forward until the starter clears the transmission.
   - Starter transmission close out cover
   - Positive battery cable and wiring harness from the starter
   - Starter

To install:

5. Install or connect the following:
   - Starter
   - Positive battery cable.
   - Starter transmission close out cover
   - Mounting bolts to the engine block and tighten to 37 ft. lbs. (50 Nm)
   - Oil level sensor connection
   - Starter-to-transmission close out cover bolt
   - Starter solenoid shield
   - Protective shields (as necessary)

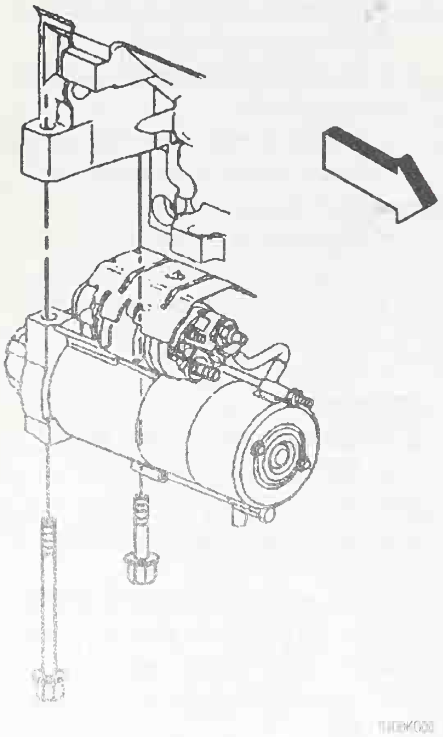


Exploded view of the starter motor–4.3L and 5.0L engines.

6. Remove the safety stands.
7. Lower the vehicle.
8. Connect the negative battery cable.

8.1L Engine

1. Remove or disconnect the following:
   - Negative battery cable



Starter removal—4.8L, 5.3L and 6.0L engines

   - Positive battery cable nut
   - Positive cable from the solenoid
   - Engine harness ground nut and ground from the solenoid
   - Mounting bolts and starter
   - Heat shield bolts, nut and shield, if necessary

To install:

2. Install or connect the following:
   - Heat shield, bolts and nut if removed. Tighten the bolts to 35 inch lbs. (3 Nm) and the nut to 44 inch lbs. (5 Nm).
   - Starter and bolts. Tighten to 37 ft. lbs. (50 Nm).
   - Ground wire and nut. Tighten to 30 inch lbs. (3.4 Nm).
   - Positive cable and nut. Tighten to 80 inch lbs. (9 Nm).
   - Negative battery cable

Oil Pan

REMOVAL & INSTALLATION

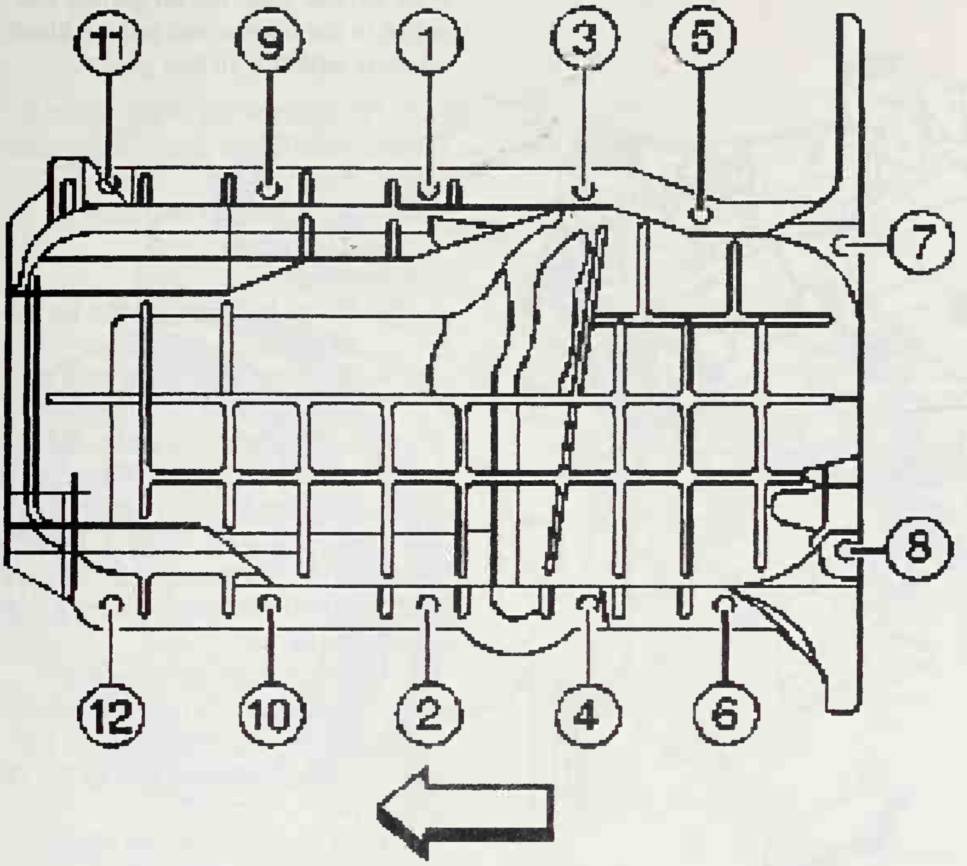
4.3L Engines

EXPRESS AND SAVANA

1. Drain the engine oil.
2. Remove or disconnect the following:
   - Negative battery cable
   - Oil filter
   - Oil filter adapter
   - Front differential carrier on AWD models
   - Bolt holding the bracket for the starter wire and transmission cooler pipes
   - Crankcase position (CKP) sensor wiring harness from the retainer.
   - Starter assembly
   - Transmission cover
   - Access plugs for the oil pan rear nuts
   - Remove and discard the engine oil level sensor, if applicable
   - Oil pan bolts/nuts and reinforcements
   - Oil pan and gaskets

To install:

3. Thoroughly clean all gasket surfaces,
4. Apply a 5 mm wide and 25 mm long bead of sealant to both the right and left sides of the engine front cover to engine block junction at the oil pan sealing surfaces.
5. Apply a 5 mm wide and 25 mm long bead of sealant to both the right and left sides of the crankshaft rear oil seal housing to engine block junction at the oil pan sealing surfaces.
6. Install or connect the following:
   - New gasket
   - Oil pan and new gasket
   - Install the oil pan bolts and nuts, but do not tighten
7. Measure the pan-to-transmission housing clearance using a feeler gage and a straight edge. Use a feeler gage to check the clearance between the oil pan-to-transmission housing measurement points. If the clearance exceeds 0.011 in. (0.3 mm) at any of the 3 oil pan-to-transmission housing measurement points (1), then repeat the step until the oil pan-to-transmission housing clearance is within the specification. The oil pan must always be forward of the rear face of the engine block.
8. Install the oil pan bolts, nuts and reinforcements. Torque bolts in sequence to 18 ft. lbs. (25 Nm).
9. Install or connect the following:
   - Install the engine oil level sensor, if applicable
   - Access plugs for the oil pan rear nuts
   - Transmission cover
   - Starter assembly
   - Crankcase position (CKP) sensor wiring harness to the retainer.
   - Bolt holding the bracket for the starter wire and transmission cooler pipes
   - Front differential carrier on AWD models



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Oil pan bolt tightening sequence—4.3L engine

- Oil filter adapter
- Oil filter
- Negative battery cable

10. Refill the engine with oil.

AVALANCHE, SIERRA AND SILVERADO

1. Drain the engine oil.
2. Disconnect the negative battery cable.
3. Raise and support the vehicle.
4. Remove or disconnect the following:
   - Oil pan skid plate bolts and plate, if equipped
   - Engine oil and filter
   - Crossmember bolts and bar
   - On 4WD, the front differential carrier
   - Battery cable bracket bolts.
   - Starter
   - Transmission cover
   - Positive battery cable clip bolt
   - Oil level sensor electrical connector
   - Transmission
   - Oil level sensor and discard
   - Oil pan bolts and oil pan
   - Oil pan gasket

To install:

5. Thoroughly clean all gasket surfaces,
6. Apply a 5 mm wide and 25 mm long bead of sealant to both the right and left sides of the engine front cover to engine block junction at the oil pan sealing surfaces.
7. Apply a 5 mm wide and 25 mm long bead of sealant to both the right and left sides of the crankshaft rear oil seal housing to engine block junction at the oil pan sealing surfaces.
8. Install or connect the following:
   - Transmission
   - New gasket
   - Oil pan and new gasket
   - Install the oil pan bolts and nuts, but do not tighten
9. Measure the pan-to-transmission housing clearance using a feeler gage and a straight edge. Use a feeler gage to check the clearance between the oil pan-to-transmission housing measurement points. If the clearance exceeds 0.011 in. (0.3 mm) at any of the 3 oil pan-to-transmission housing measurement points (1), then repeat the step until the oil pan-to-transmission housing clearance is within the specification. The oil pan must always be forward of the rear face of the engine block.
10. Install the oil pan bolts, nuts and reinforcements. Torque bolts in sequence to 18 ft. lbs. (25 Nm).
    - Oil level sensor electrical connector
    - Positive battery cable clip bolt
    - Transmission cover
    - Starter
    - Battery cable bracket bolts.
    - On 4WD, the front differential carrier
    - Crossmember bolts and bar
    - Engine oil and filter
    - Oil pan skid plate bolts and plate, if equipped
    - Negative battery cable
11. Refill the engine with oil.

4.8L, 5.3L and 6.0L Engines

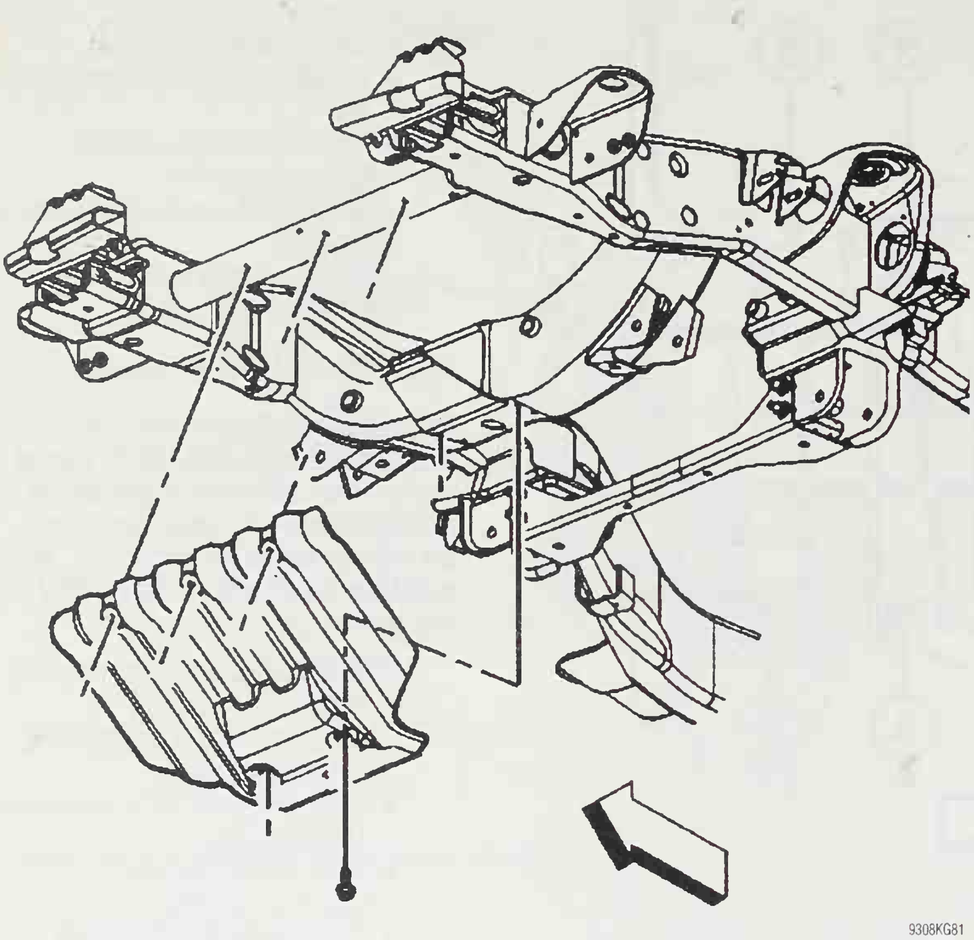
➡The original oil pan gasket is retained and aligned to the oil pan by rivets. When installing a new gasket, it is not necessary to install new rivets. DO NOT reuse the oil pan gasket. When installing the oil pan, install a NEW oil pan gasket.

1. Remove or disconnect the following:
   - Negative battery cable
   - Front differential if equipped with four wheel drive
   - Under body shield from the vehicle
   - Oil pan shield
   - Cross brace if equipped
   - Engine oil and filter
   - Transmission-to-oil pan bolts
   - Oil level sensor electrical connector
   - Two front wiring harness retainer bolts
   - Engine wiring harness retainer bolts from the engine oil pan
   - Engine oil cooler pipe-to-oil pan bolt
   - Transmission oil cooler pipe retainer and the bolt from the oil pan
   - Closeout covers and bolts (one each side of engine)
   - Engine mount bolts each side
   - Oil pan

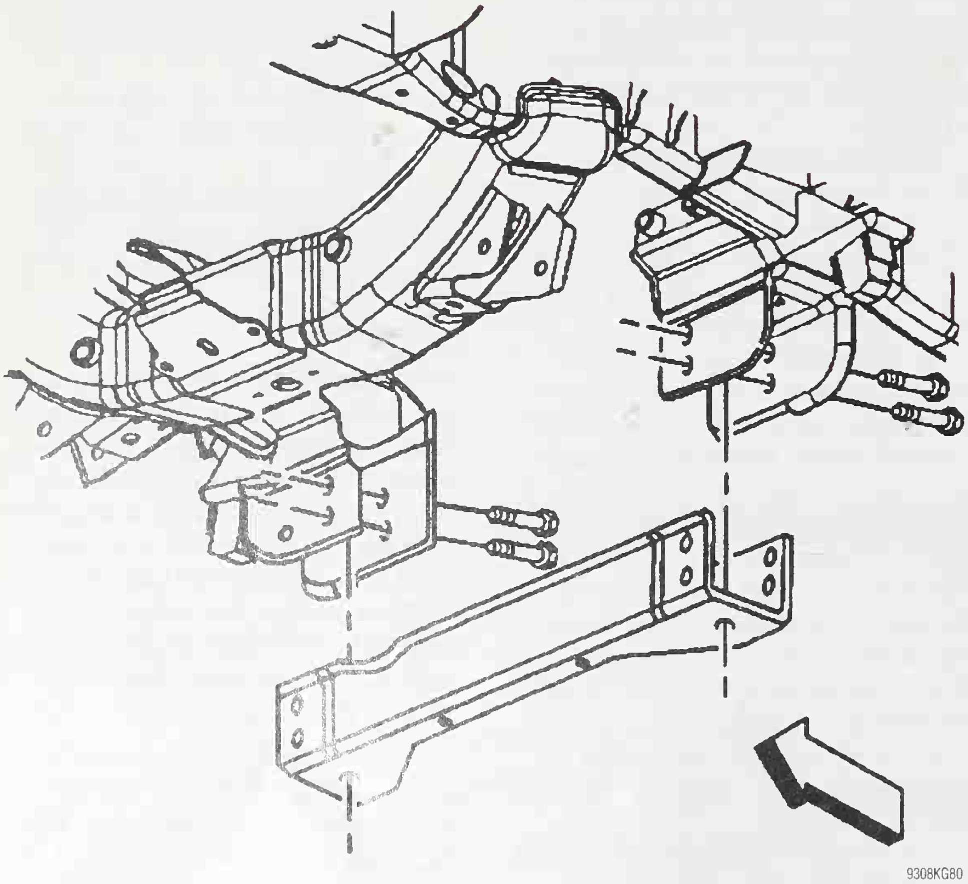
To install:

➡The alignment of the structural oil pan is critical. The rear bolt hole locations of the oil pan provide mounting points for the transmission bellhousing. To ensure the rigidity of the powertrain and correct transmission alignment, it is important that the rear of the block and the rear of the oil pan must NEVER protrude beyond the engine block and transmission bellhousing plane.

2. Apply a 0.20 in. (5mm) bead of sealant GM P/N 12378190 or equivalent 0.8 in. (20mm) long to the engine block. Apply the sealant directly onto the tabs of the front cover gasket that protrudes into the oil pan surface.



Oil pan shield—4.8L, 5.3L and 6.0L engines



Cross brace—4.8L, 5.3L and 6.0L engines

➡Be sure to align the oil gallery passages in the oil pan and engine block properly with the oil pan gasket.

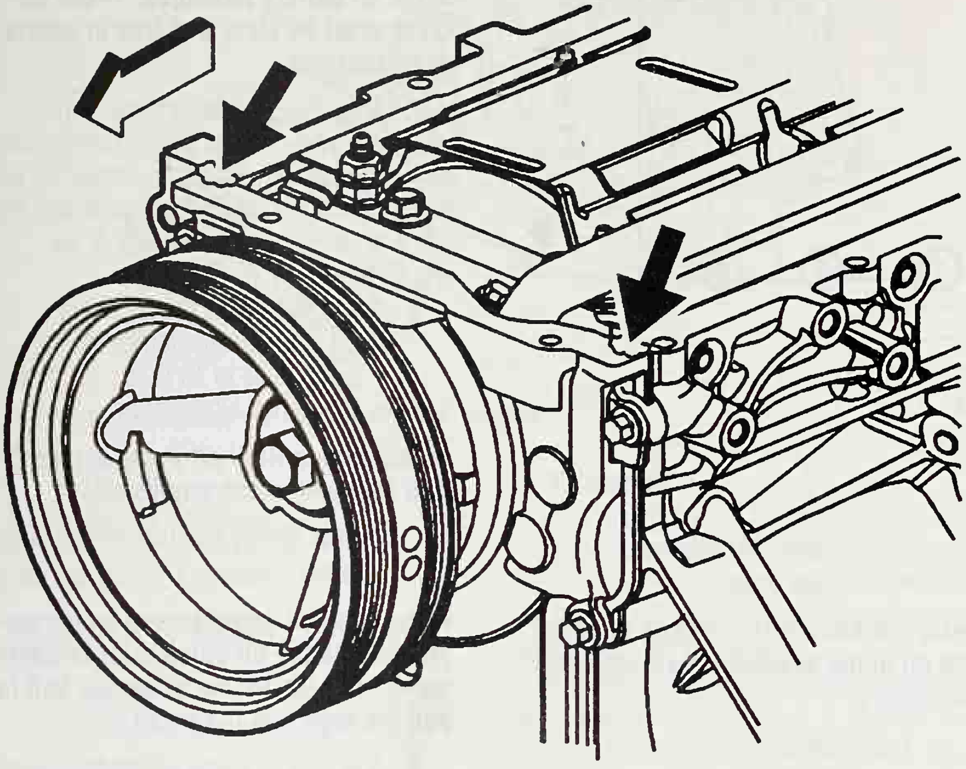
3. Pre-assemble the oil pan gasket to the pan. Install the oil pan bolts to the pan through the gasket.
4. Install or connect the following:
   - Oil pan gasket
   - Oil pan
   - Oil pan bolts, finger-tight. Do not overtighten.
   - Two lower bellhousing bolts to position the oil pan correctly
5. Snug the lower bellhousing bolt finger-tight. Do not overtighten. Tighten the oil pan-to-block and oil pan-to-oil pan front cover bolts to 18 ft. lbs. (25 Nm). Tighten the oil pan-to-rear cover bolts to 106 inch lbs. (12 Nm). Tighten the bellhousing bolts to 37 ft. lbs. (50 Nm).
   - Transmission oil cooler pipe retainer and the bolt to the oil pan
   - Engine oil cooler pipe-to-oil pan bolt and tighten to 89 inch lbs. (10 Nm)
   - Engine wiring harness retainer bolts to the engine oil pan
   - Oil level sensor electrical connector
   - Transmission-to-oil pan bolts and tighten to 41 ft. lbs. (55 Nm)
   - Front differential, if equipped with four wheel drive
   - Underbody shield
6. Lower the vehicle. Fill the engine with oil and install the engine oil filter.
7. Connect the negative battery cable.

5.0L and 5.7L Engines

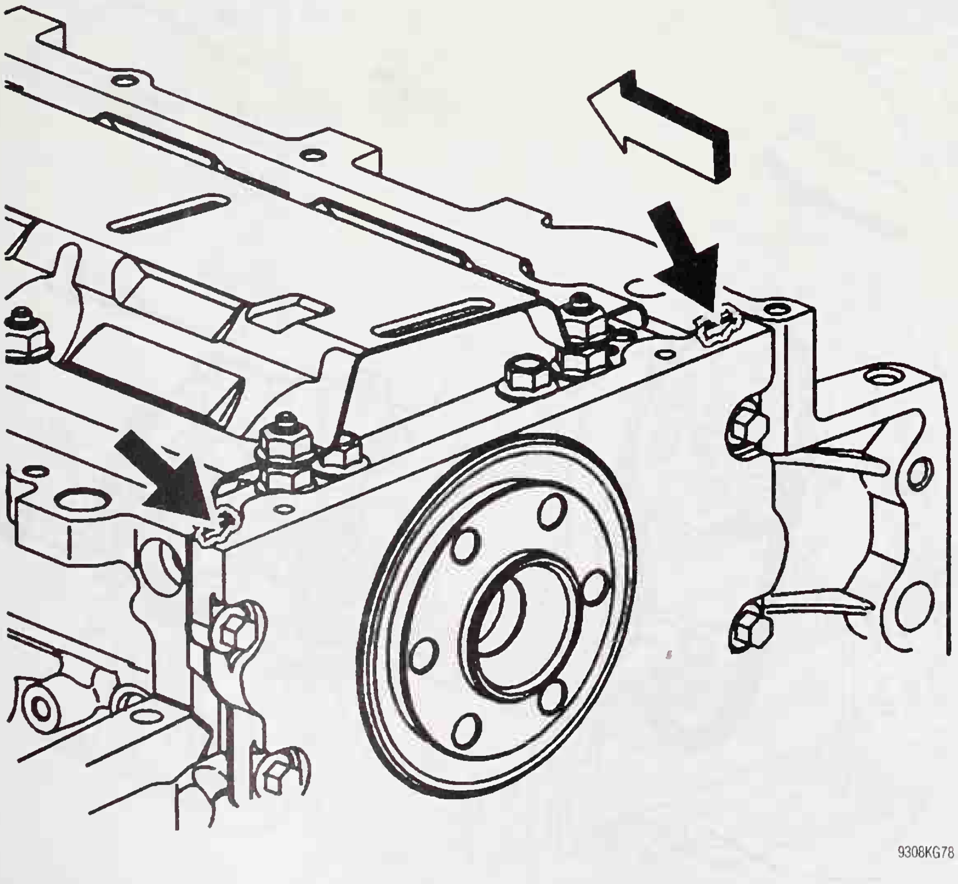
1. Drain the engine oil.
2. Remove or disconnect the following:
   - Negative battery cable
   - Underbody protector shields
   - Transmission and engine oil lines from guides
   - Front driveshaft, if needed
   - Front drive axles, if needed
   - Exhaust crossover pipe
   - Flywheel/flexplate or torque converter cover
   - Oil filter and adapter
   - Strut rods at the front engine mounting, if equipped
   - Oil pan bolts, nuts and reinforcements
   - Oil pan and gaskets

To install:

3. Thoroughly clean all gasket surfaces.
4. Install or connect the following:
   - New gasket
   - Oil pan
   - Oil pan bolts, nuts and reinforce-



Apply sealant at these points at the front of the block—4.8L, 5.3L and 6.0L engines



Apply sealant at these points at the rear of the block—4.8L, 5.3L and 6.0L engines

ments. Torque the bolts to 18 ft. lbs. (25 Nm).

- Strut rods at the front engine mounting
- Oil filter and adapter
- Torque converter or flywheel/flexplate cover
- Exhaust crossover pipe
- Front drive axles and driveshaft, if removed
- Transmission and engine oil lines to guides
- Underbody protectors
- Negative battery cable

5. Fill the crankcase with oil.

8.1L Engine

➡Removal of the transmission may be necessary on vans.

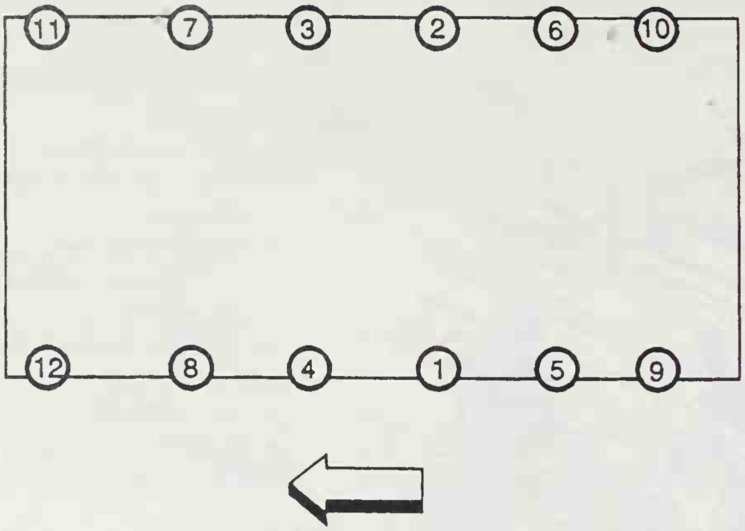
1. Disconnect the negative battery cable and drain the engine oil.
2. Remove or disconnect the following:
   - Front differential, if equipped with 4WD
   - Starter motor
   - Oil pan skid plate bolts and plate
   - Crossbar bolt(s) and crossbar
   - Oil level dipstick
   - Oil level sensor electrical connector
   - Engine harness clip from the oil pan
   - Battery cable channel bolt
   - Battery cable channel and reposition
   - Oil pan bolts, oil pan and gasket

➡You can reuse the oil pan gasket, if it is not damaged

To install:

➡You must install the oil pan within 5 minutes of applying the sealer.

3. Before servicing the vehicle, refer to the precautions in the beginning of this section.
4. Apply sealant to the sides of the front and rear crankshaft bearing caps on the left and right sides.
5. Install or connect the following:
   - Oil pan gasket into the oil pan groove
   - Oil pan and bolts
6. Tighten the oil pan bolts, in sequence, as follows:
   a. 1st pass: 89 inch lbs. (10 Nm).
   b. 2nd pass: 18 ft. lbs. (25 Nm).
7. Install or connect the following:
   - Battery cable channel and bolt. Tighten to 80 inch lbs. (9 Nm).
   - Oil level sensor and tighten to 15 ft. lbs. (20 Nm)



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Oil pan bolt tightening sequence—8.1L engine

- Engine harness clip
- Oil level sensor connector
- Oil level dipstick
- Crossbar and bolt(s). Tighten to 74 ft. lbs. (100 Nm).
- Skid plate. Tighten the bolts to 15 ft. lbs. (20 Nm).
- Starter motor
- Front differential
- Negative battery cable

8. Fill the crankcase with oil.

Oil Pump

REMOVAL & INSTALLATION

4.3L Engines

1. Remove or disconnect the following:
    - Oil pan
    - Oil pump mounting bolt
    - Oil pump

To install:

2. Inspect the oil pump locator pins for damage, and replace if required.
3. Clean and inspect the oil pump.
4. Position the oil pump onto the locator pins.
5. Install the oil pump bolt and tighten the bolt to 66 ft. lbs. (90 Nm).
6. Install the oil pan

4.8L, 5.3L and 6.0L Engines

1. Remove or disconnect the following:
    - Engine front cover
    - Oil pan
    - Oil pump screen bolt and nuts
    - Oil pump screen with O-ring seal.
    - O-ring seal from the pump screen. Discard the O-ring seal.
    - Remaining crankshaft oil deflector nuts.
    - Crankshaft oil deflector
    - Oil pump bolts

➡Do not allow dirt or debris to enter the oil pump assembly, cap ends as necessary.

- Oil pump

➡The internal parts of the oil pump assembly are not serviced separately (excluding the spring). If the oil pump components are worn or damaged, replace the oil pump as an assembly. Do not attempt to repair the wire mesh portion of the pump and screen assembly.

To install:

➡Inspect the oil pump and engine block oil gallery passages. These surfaces must be clear and free of debris or restrictions.

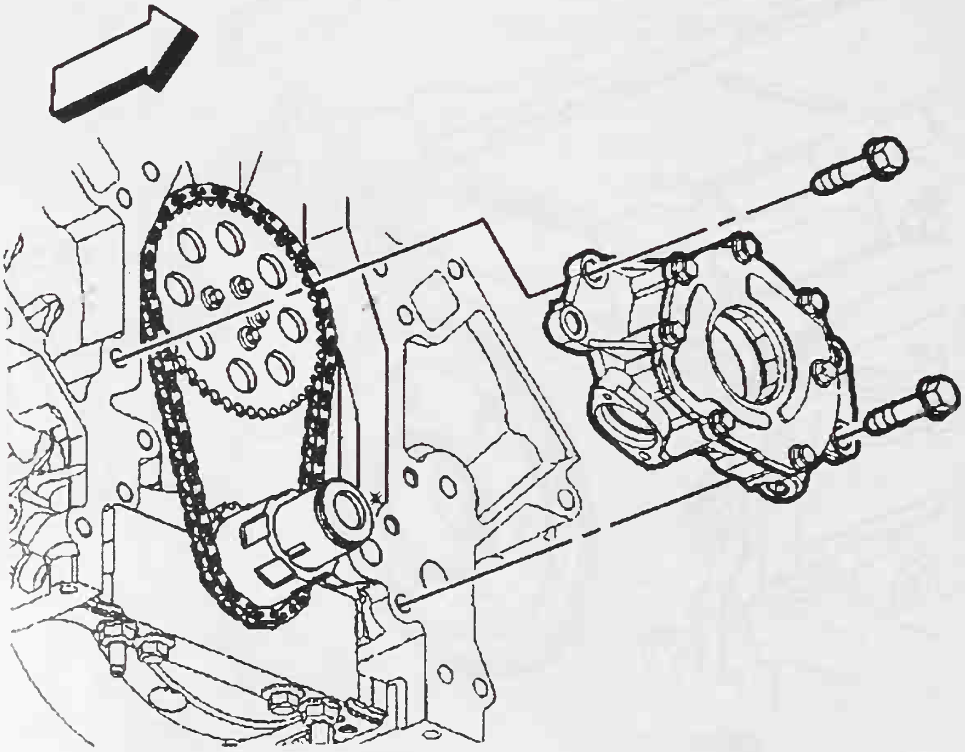
2. Align the splined surfaces of the crankshaft sprocket and the oil pump drive gear and install the oil pump. Install the oil pump onto the crankshaft sprocket until the pump housing contacts the face of the engine block.
3. Install or connect the following:
    - Oil pump bolts. Tighten the oil pump bolts to 18 ft. lbs. (25 Nm).
    - Crankshaft oil deflector

➡Lubricate a NEW oil pump screen O-ring seal with clean engine oil.

- NEW O-ring seal onto the oil pump screen

➡Push the oil pump screen tube completely into the oil pump prior to tightening the bolt. Do not allow the bolt to pull the tube into the pump.

4. Align the oil pump screen mounting brackets with the correct crankshaft bearing cap studs.
5. Install or connect the following:
    - Oil pump screen
    - Oil pump screen bolt and the deflector nuts. Tighten the bolt to 106 inch lbs. (12 Nm) and the nuts to 18 ft. lbs. (25 Nm).



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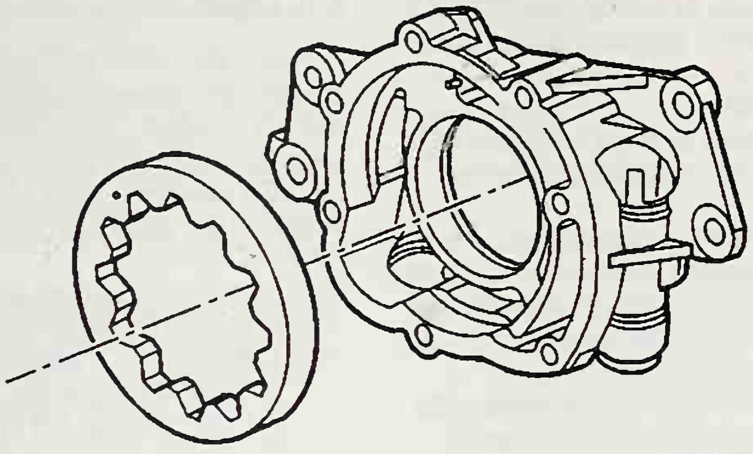
Oil pump removal—4.8L, 5.3L and 6.0L engines



Oil pump disassembly—4.8L, 5.3L and 6.0L engines

- Oil pan
- Engine front cover

5.0L and 5.7L Engines

1. Remove or disconnect the following:
    - Oil pan
    - Oil pump attaching bolt, if equipped
    - Pick-up tube nut/bolt
    - Pump along with the pick-up tube and shaft, as necessary
2. Clean all sealing surfaces

To install:

3. Ensure that the pump pick-up tube is tight in the pump body. If the tube should come loose, oil pressure will be lost and oil starvation will occur. If the pick-up tube is loose it should be replaced.
4. If the pump has been disassembled and is being replaced or for any reason oil has been removed, it must be primed. It can either be filled with oil before installing the cover plate and oil kept within the pump during handling or the entire pump cavity can be filled with petroleum jelly.

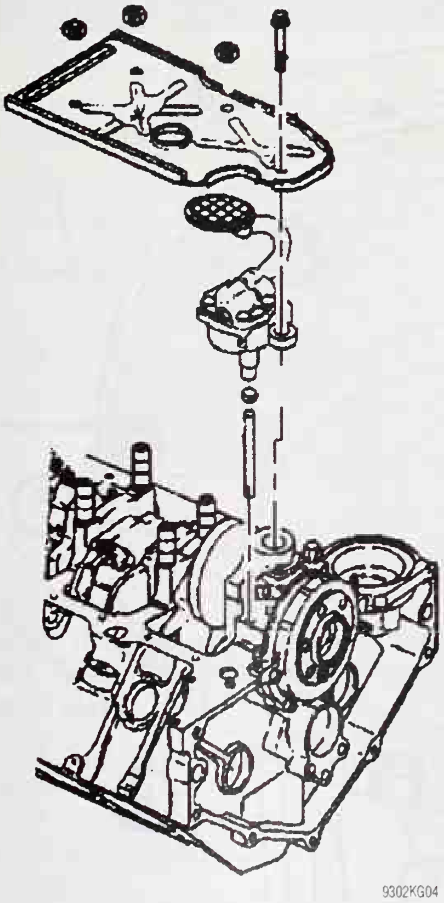
➡If the pump is not primed, the engine could be damaged before it receives adequate lubrication when the engine is started.

5. Install or connect the following:
    - Pump, aligning the pump shaft with the oil pump drive gear as necessary. Torque oil pump/pick-up tube retainer(s) to 65 ft. lbs. (90 Nm).
    - Oil pan
6. Refill the engine crankcase
7. Disable the ignition system; crank engine for approximately 10 seconds to aid in priming the oil pump and reducing the risk of engine damage.

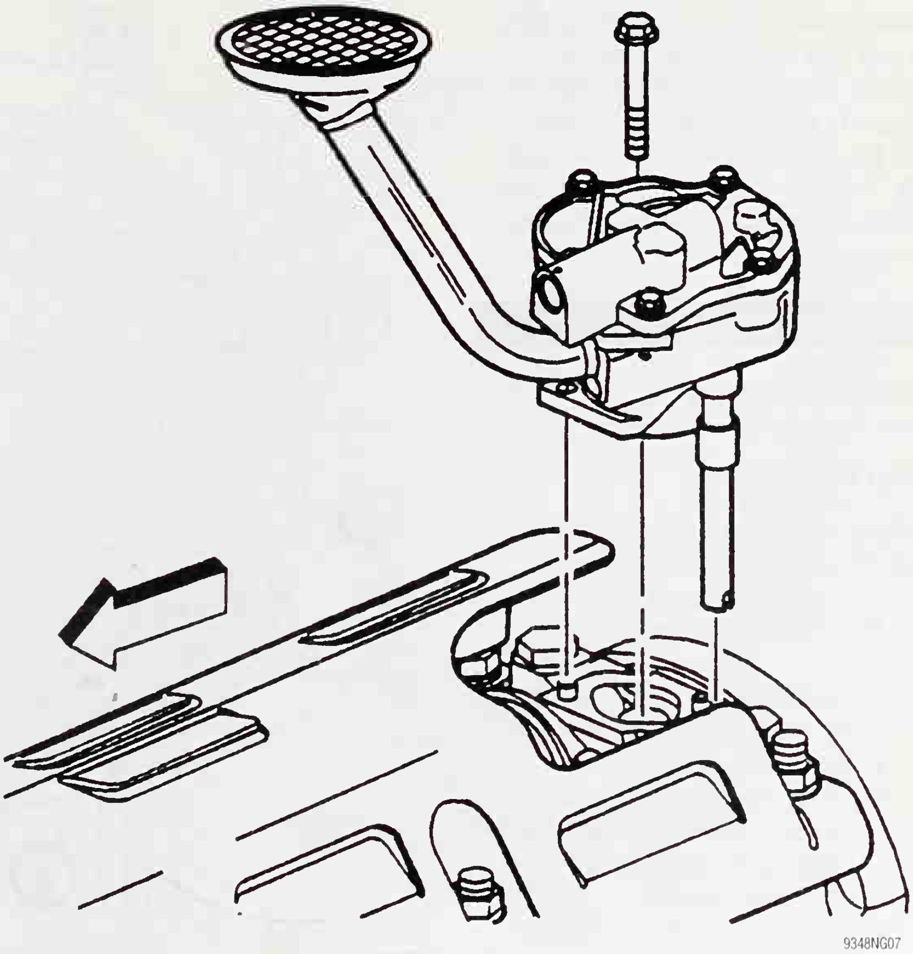
➡If the oil pump does not build up oil pressure almost immediately, remove the pan and check for a loose oil pump-to-pick-up tube attachment. If necessary dismantle the pump and pack the pump cavity with petroleum jelly. Running the engine without measurable oil pressure will cause extensive damage.

8.1L Engine

1. Remove or disconnect the following:
    - Oil pan
    - Oil pump screen bolt



Exploded view of the oil pump mounting—4.8L, 5.3L and 6.0L engines



Oil pump removal—8.1L engine

- Oil pump, retainer and driveshaft. Discard the driveshaft retainer
- Crankshaft oil deflector nuts
- Crankshaft oil deflector
- Oil pump bolts
- Oil pump

2. Clean and inspect the oil pump

To install:

3. Install the crankshaft oil deflector. Tighten the nuts to 37 ft. lbs. (50 Nm).

➡Always replace the retainer between the oil pump and the shaft, when installing the oil pump. During assembly, install a new oil pump driveshaft retainer. To ease installation, slightly heat the retainer to above room temperature.

4. Assemble the oil pump, driveshaft and a new retainer.
5. Install or connect the following:
    - Oil pump, positioning it on the locating pins
    - Oil pump bolt and tighten to 56 ft. lbs. (75 Nm)
    - Oil pan
6. Refill the engine crankcase
7. Disable the ignition system; crank engine for approximately 10 seconds to aid in priming the oil pump and reducing the risk of engine damage.

➡If the oil pump does not build up oil pressure almost immediately, remove the pan and check for a loose oil pump-to-pick-up tube attachment. If necessary dismantle the pump and pack the pump cavity with petroleum jelly. Running the engine without measurable oil pressure will cause extensive damage.

Rear Main Seal

REMOVAL & INSTALLATION

Except 8.1L Engine

Please note that the entire transmission assembly and flywheel/flexplate must be removed to perform this procedure.

1. Remove or disconnect the following:
    - Negative battery cable
    - Transfer case, if equipped
    - Transmission assembly
    - Clutch assembly and flywheel, if equipped with manual transmission
    - Flexplate, if equipped with automatic transmission
    - Crankshaft rear main oil seal by inserting a suitable prying tool and prying the seal out. Take care not to damage the crankshaft sealing surface.

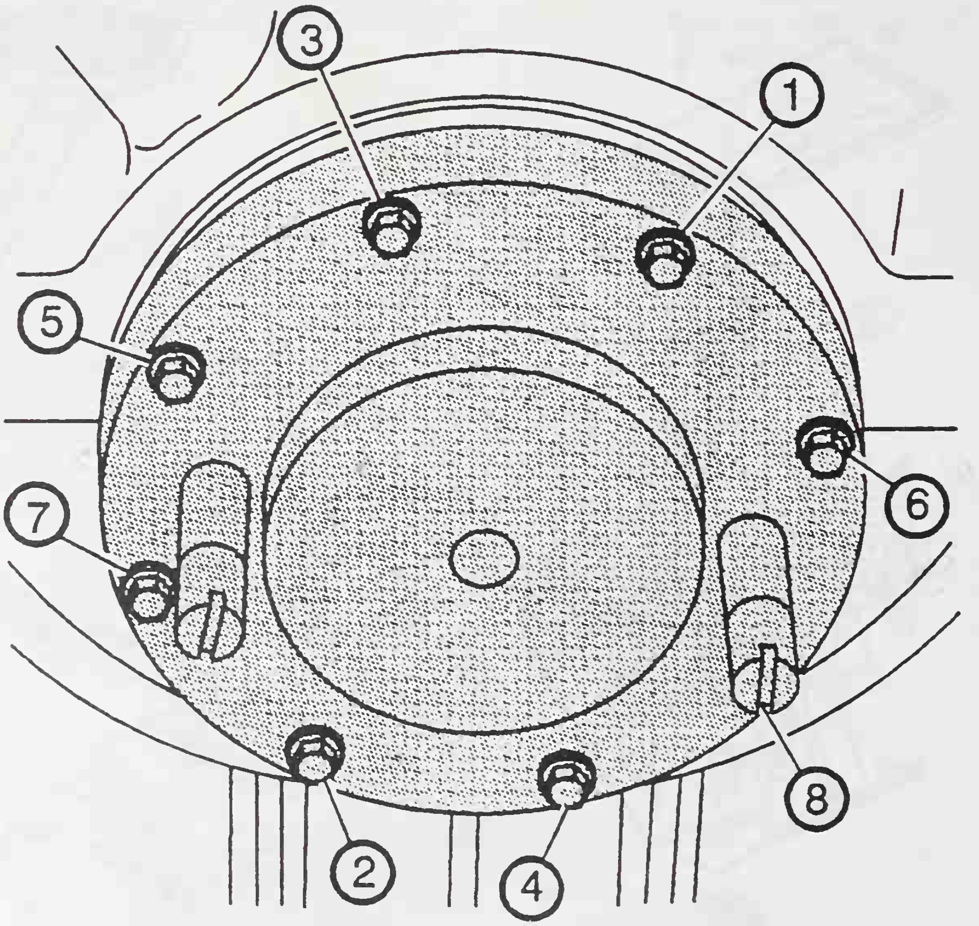
To install:

2. Clean the oil seal bore in the block thoroughly before installation of the new seal.
3. Inspect the crankshaft for grit, rust or burrs and correct as necessary. Also inspect the portion of the crankshaft where the oil seal makes contact, for wear due to the rubbing action of the oil seal.
4. Clean the seal running surface of the crankshaft with a non-abrasive cleaner.
5. Lubricate the inner diameter of the new seal and the outer diameter of the crankshaft with engine oil.
6. Install or connect the following:
    - Rear main oil seal, using installation tool J 38841, J-35621-B or J-41479, until the tool bottoms against the block and crankshaft rear main bearing cap.
    - Flywheel and clutch
    - Flexplate, as required
    - Transmission assembly
    - Transfer case, if equipped
    - Negative battery cable
7. Start the engine and verify no oil leaks.

8.1L Engine

Please note that the entire transmission assembly and flywheel/flexplate must be removed to perform this procedure. This procedure requires the use of the following tools: Crankshaft Rear Seal Puller tool No. J 43320 and Crankshaft Rear Seal Installer tool No. J 42849.

1. Remove or disconnect the following:
    - Negative battery cable
    - Transfer case, if equipped
    - Transmission assembly
    - Clutch assembly and flywheel, if equipped with manual transmission
    - Flexplate, if equipped with automatic transmission
2. Install the guide pins from the Crankshaft Rear Sear Puller into the crankshaft.
3. Install the Rear Seal Puller over the guide pins.
4. Using a drill, insert 8 of the self-drilling sheet metal screws into the rear crankshaft seal, using a crisscross pattern as shown. The self tapping screws are included with the Crankshaft Rear Seal Puller.
5. Thread the center bolt of the Crankshaft Rear Seal Puller into the crankshaft to remove the seal.



Drill the screws into the rear main seal using a crisscross pattern—8.1L engine

6. Remove the guide pins from the crankshaft.

To install:

7. Make sure there is no dirt, rust or loose burrs on the crankshaft.

8. Apply a light coating of engine oil to the crankshaft sealing surface. Do NOT get oil on the sealing surface of the engine block.

9. Install the new rear main seal onto the Crankshaft Rear Seal Installation Tool.

10. Position the Rear Seal Installation Tool against the crankshaft. Thread the attaching screws into the tapped holes in the crankshaft.

11. Use a screwdriver to tighten the screws securely to make sure the seal is squarely installed against the crankshaft.

12. Rotate the center nut until the installation tool bottoms, then remove the seal installation tool.

13. Install or connect the following:
    - Flexplate, if equipped with automatic transmission
    - Clutch assembly and flywheel, if equipped with manual transmission
    - Transmission assembly
    - Transfer case, if equipped
    - Negative battery cable

Timing Chain, Sprockets, Front Cover and Seal

The manufacturer recommends that the front cover oil seal be replaced whenever the cover is removed.

REMOVAL & INSTALLATION

4.3L, 5.0L and 5.7L Engines

1. Drain the cooling system.

2. Remove or disconnect the following:
    - Negative battery cable
    - Fan shroud assembly
    - Belts, pulleys and water pump assembly
    - Crankshaft pulley and damper
    - Oil pan-to-front cover bolts

➡If equipped with a composite front cover, it must be replaced with a new one. Reusing the front cover may result in oil leaks.

3. Remove the engine shield bolts and shield.

4. Disconnect the Crankshaft Position (CKP) sensor electrical connector, if equipped.

5. Remove the CKP sensor and discard the o-ring.
    - Screws holding the timing chain cover to the block
    - Cover and gaskets.

6. Remove the crankshaft position (CKP) sensor reluctor ring, if equipped.

7. Use a suitable tool to pry the old seal out of the front face of the cover.

8. Rotate the crankshaft until the timing marks on the camshaft and crankshaft sprockets are in proper alignment. This will put no. 4 cylinder at TDC.

9. Unsnap the timing chain tensioner shoe from the pin.

10. Remove or disconnect the following:
    - Camshaft sprocket-to-camshaft nut and/or bolts
    - Camshaft sprocket (along with the timing chain), if the sprocket is difficult to remove, use a plastic mallet to bump the sprocket from the camshaft.

➡The camshaft sprocket (located by a dowel) is lightly pressed onto the camshaft and should come off easily. The chain comes off with the camshaft sprocket.

11. If necessary use J-5825-A, or equivalent, crankshaft sprocket removal tool to free the timing sprocket from the crankshaft.

12. Remove the crankshaft balancer key.

13. If necessary, remove the timing chain tensioner bracket bolt and bracket.

To install:

14. Inspect the timing chain and the timing sprockets for wear or damage, replace the damaged parts as necessary.

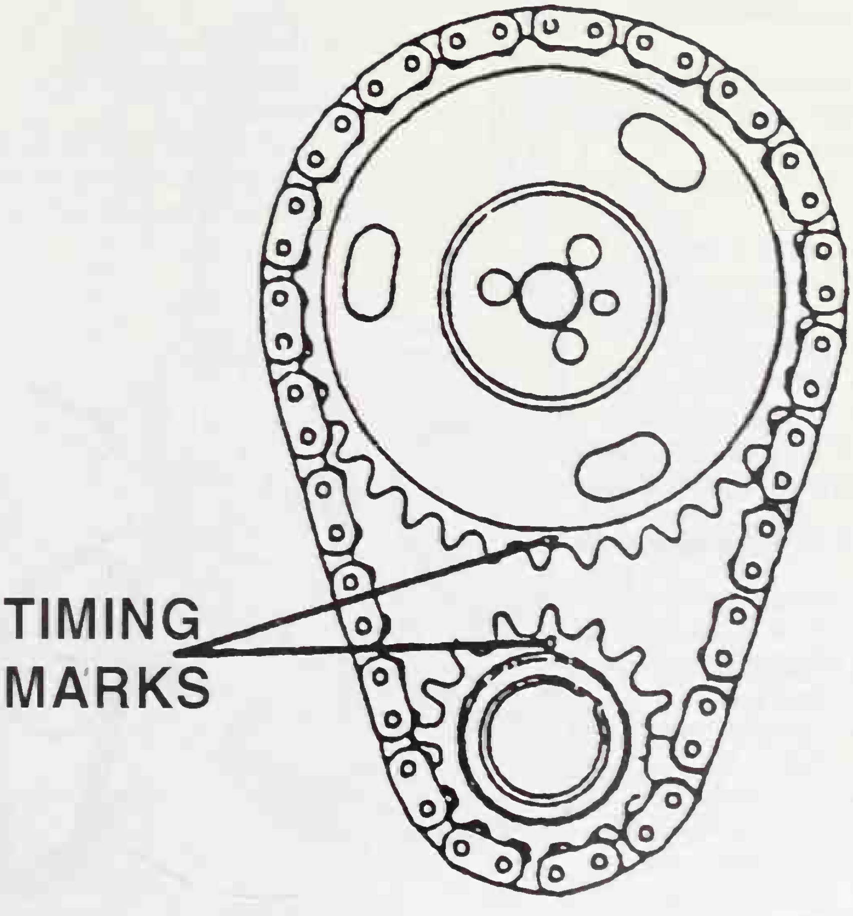
15. Clean the gasket mounting surfaces of all remaining traces of old gasket.

➡During installation, coat the thrust surfaces lightly with Molykote® or equivalent pre-lube.

16. If necessary, install the timing chain tensioner bracket and bolt and tighten to 106 inch lbs. (12 Nm).

17. Install the key into the crankshaft keyway. The crankshaft balancer key should be parallel to the crankshaft or with a slight incline.

18. Install or connect the following:
    - Crankshaft sprocket onto the crankshaft, use tool J-5590, crankshaft sprocket installation tool, and a hammer, without disturbing the position of the engine.
    - Timing chain, arrange the camshaft sprocket in such a way that the timing marks will align between the shaft centers and the camshaft locating dowel will enter the dowel hole in the cam sprocket.



Timing mark alignment for timing chain removal and installation—gasoline engines

- Cam sprocket, with the chain mounted under it in position on the front of the camshaft. Torque the camshaft sprocket-to-camshaft retainer bolts to 106 inch lbs. (12 Nm) on 5.0L and 5.7L, or 18 ft. lbs. (25 Nm) on 4.3L.

19. Install the timing chain tensioner shoe onto the bracket and position the top of the shoe under the tab at the top of the bracket.

20. With the timing chain installed, turn the crankshaft 2 complete revolutions, then check to make certain that the timing marks are in correct alignment between the shaft centers.

➡Coat the lip of the new seal with oil prior to installation.

- New seal so that the open end is toward the inside of the cover, using seal driver J-22102
- New front pan seal, cutting the tabs off.

21. Coat a new cover gasket with adhesive sealer and position it on the block.

22. Apply a ⅛ in. (3mm) bead of RTV gasket material to the front cover.

23. Install the crankshaft position (CKP) sensor reluctor ring, if equipped.

24. Install the front cover carefully onto the locating dowels and tighten the attaching screws

25. Install the CKP sensor and new o-ring.

26. Connect the Crankshaft Position (CKP) sensor electrical connector, if equipped.

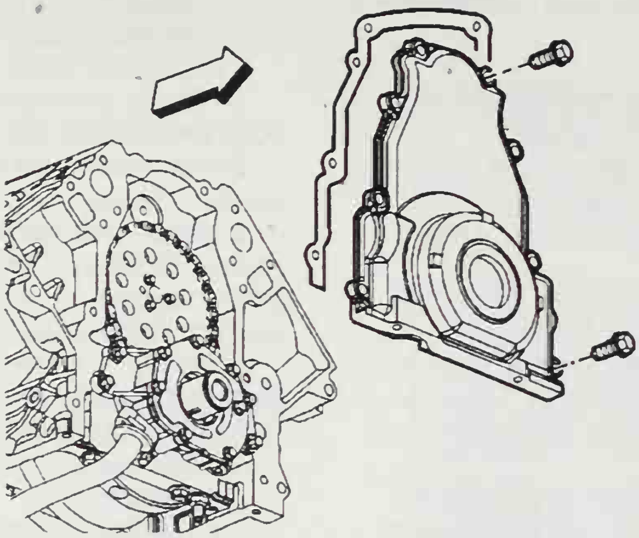
27. Install the engine shield bolts and shield.

- Oil pan, if removed
- Cover-to-pan bolts and tighten to 106 inch lbs. (12 Nm)
- Torsional damper
- Water pump assembly
- Negative battery cable

28. Fill the cooling system with the proper type and quantity of antifreeze.

4.8L, 5.3L and 6.0L Engines

1. Drain the cooling system.
2. Remove or disconnect the following:
   - Negative battery cable
   - Water pump
   - Crankshaft balancer from the crankshaft
   - Front cover bolts
   - Front cover and gasket. Discard the front cover gasket.
   - Crankshaft front oil seal from the cover



Front cover and gasket—4.8L, 5.3L and 6.0L engines

- Oil pump

3. Rotate the crankshaft until the timing marks on the crankshaft and the camshaft sprockets are aligned.

➡Do not turn the crankshaft assembly after the timing chain has been removed in order to prevent damage to the piston assemblies or the valves.

4. Remove or disconnect the following:

- Camshaft sprocket bolts
- Camshaft sprocket and timing chain
- Crankshaft sprocket
- Crankshaft sprocket key

To install:

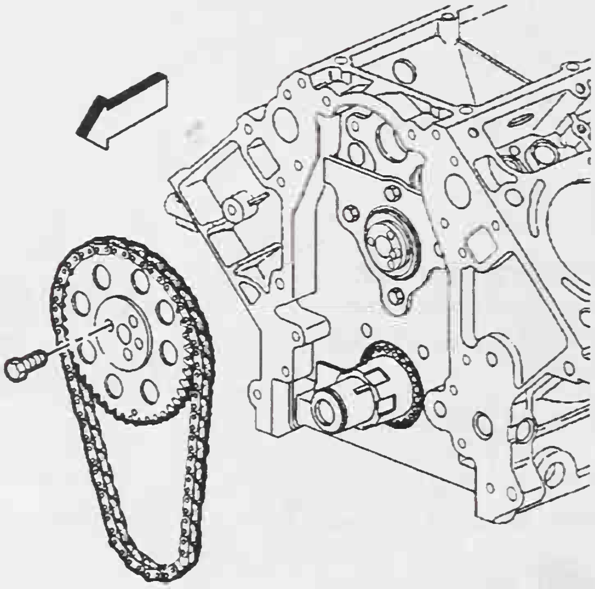
5. Install or connect the following:

- Key into the crankshaft keyway
- Crankshaft sprocket onto the front of the crankshaft. Align the crankshaft key with the crankshaft sprocket keyway. Rotate the crankshaft sprocket until the alignment mark is in the 12 o'clock position.
- Camshaft sprocket and timing chain. Locate the camshaft sprocket alignment mark in the 6 o'clock position.
- Camshaft sprocket bolts and tighten to 26 ft. lbs. (35 Nm)

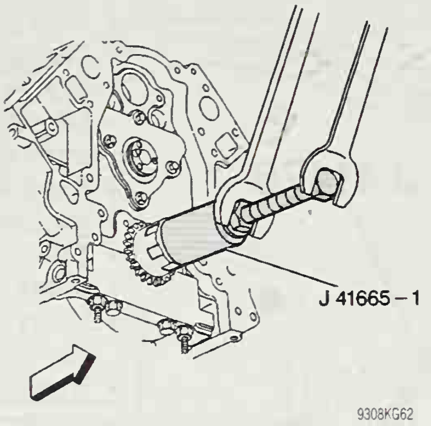
➡Do not lubricate the oil seal sealing surface.

6. Lubricate the outer edge of the oil seal with clean engine oil. Lubricate the front cover oil seal bore with clean engine oil.

7. Install the crankshaft front oil seal with an installer.



Sprocket and chain removal—4.8L, 5.3L and 6.0L engines



Crankshaft sprocket installation—4.8L, 5.3L and 6.0L engines

➡Do not apply any type of sealant to the front cover gasket (unless specified). Special tools are used to properly align the engine front cover at the oil pan surface and to center the crankshaft front oil seal.

8. Install the front cover gasket, cover, and bolts onto the engine. Tighten the cover bolts finger-tight. Do not overtighten.
9. Start the J41480 tool-to-front cover bolts. Don't tighten the bolts yet.

➡Align the tapered legs of the tool with the machined alignment surfaces on the front cover.

10. Install tool J41476 . Install the crankshaft balancer bolt. Tighten the crankshaft balancer bolt by hand until snug. Do not overtighten. Tighten the J41480 bolts and front cover bolts to 18 ft. lbs. (25 Nm).
11. Remove the tools.
12. Install the used crankshaft balancer bolt and tighten to 240 ft. lbs. (330 Nm).
13. Remove the used bolt.

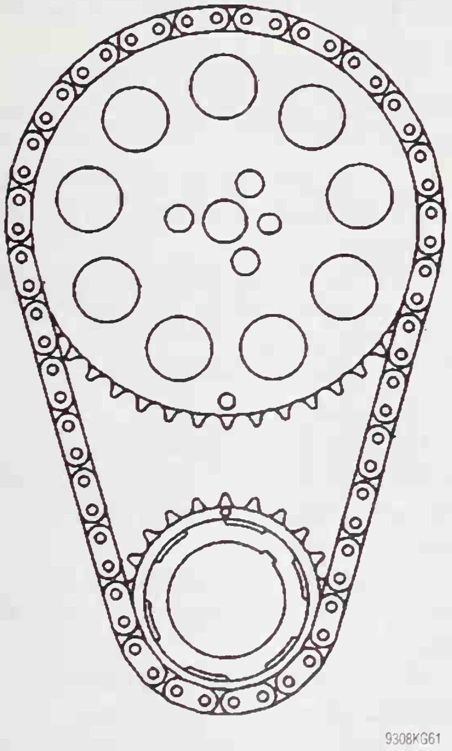
➡The nose of the crankshaft should be recessed 2.4-4.48 mm (0.094-0.176 in) into the balancer bore.

14. Install a NEW crankshaft balancer bolt and tighten to 37 ft. lbs. (50 Nm),, then tighten an additional 140 degrees.
15. Place a straight edge across the engine block and front cover oil pan sealing surfaces. Avoid contact with the portion of the gasket that protrudes into the oil pan surface. Insert a feeler gauge between the front cover and the straight edge tool. The cover must be flush with the oil pan surface or no more than 0.02 in. (0.5mm) below flush. If the front cover-to-engine block oil pan surface alignment is not within specifications, repeat the cover alignment procedure. If the correct front cover-to-engine block alignment cannot be obtained, replace the front cover.
16. Install the crankshaft balancer bolt. Tighten the crankshaft balancer bolt by hand until snug. Do not overtighten the bolt.
17. Snug the oil pan-to-cover bolts in order to position the cover at the pan rail.
18. Tighten the oil pan-to-front cover bolts to 18 ft. lbs. (25 Nm).
19. Tighten the front cover bolts to 18 ft. lbs. (25 Nm).
20. Install the water pump.

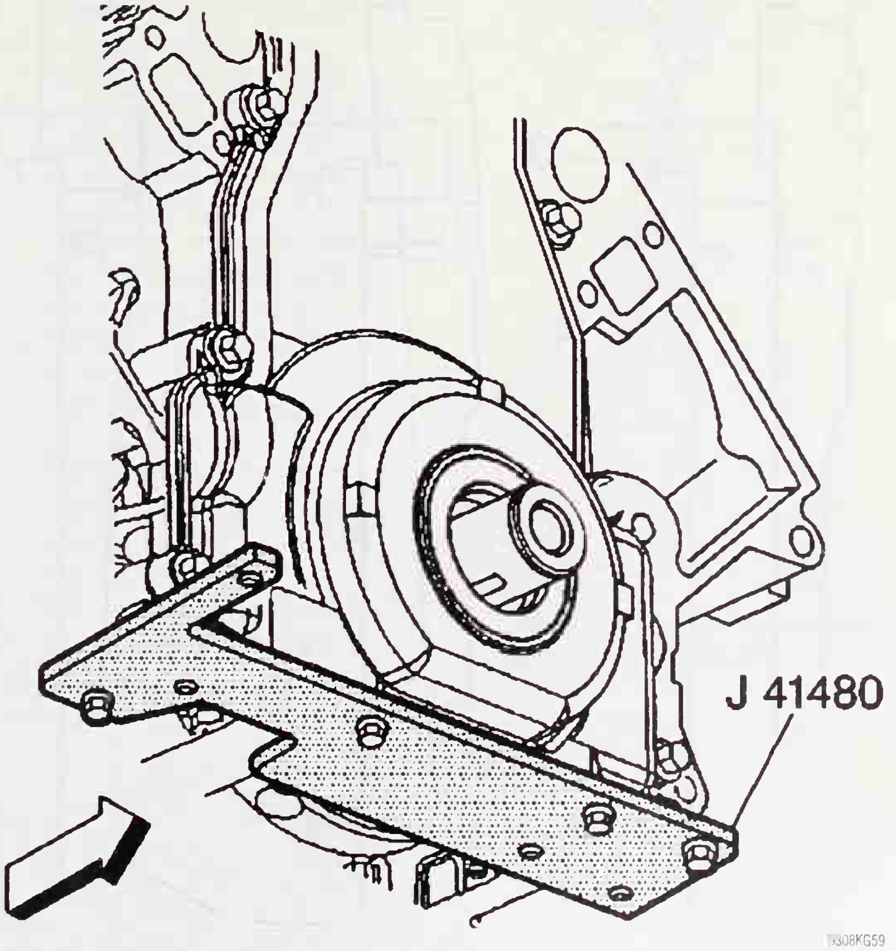
8.1L Engine

➡This procedure requires the use of Crankshaft Sprocket Installer tool No. J 22102 and Crankshaft Protector Button tool No. J 42846.

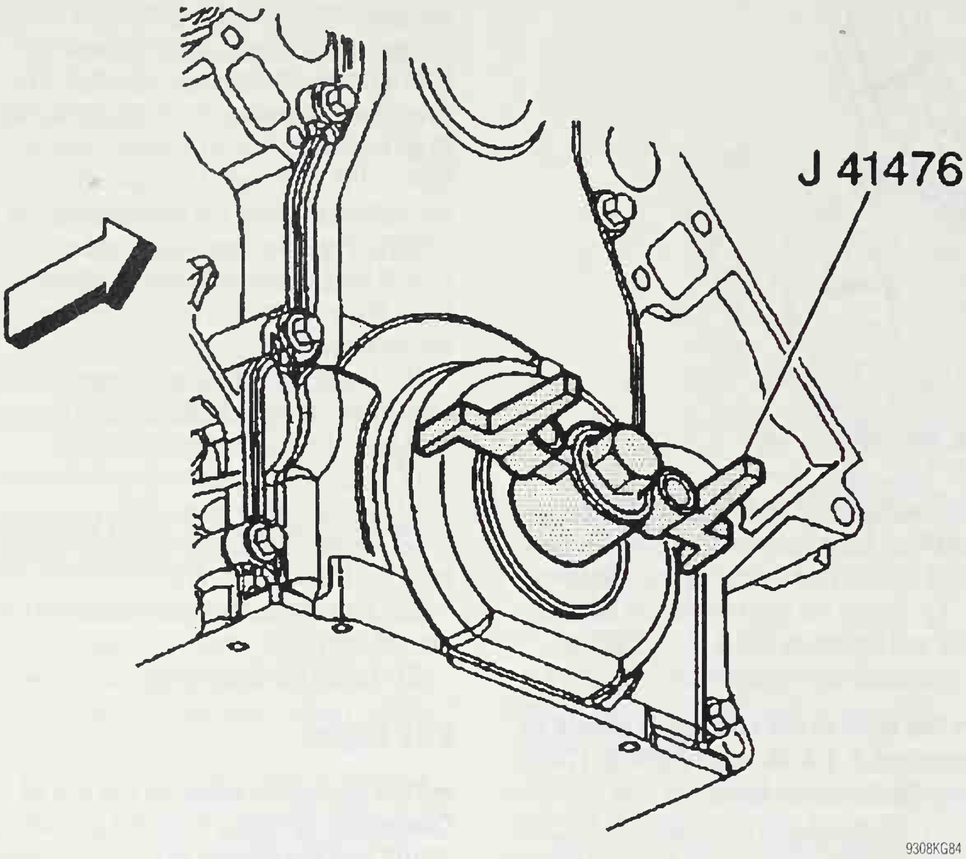
1. Drain the cooling system.
2. Remove or disconnect the following:



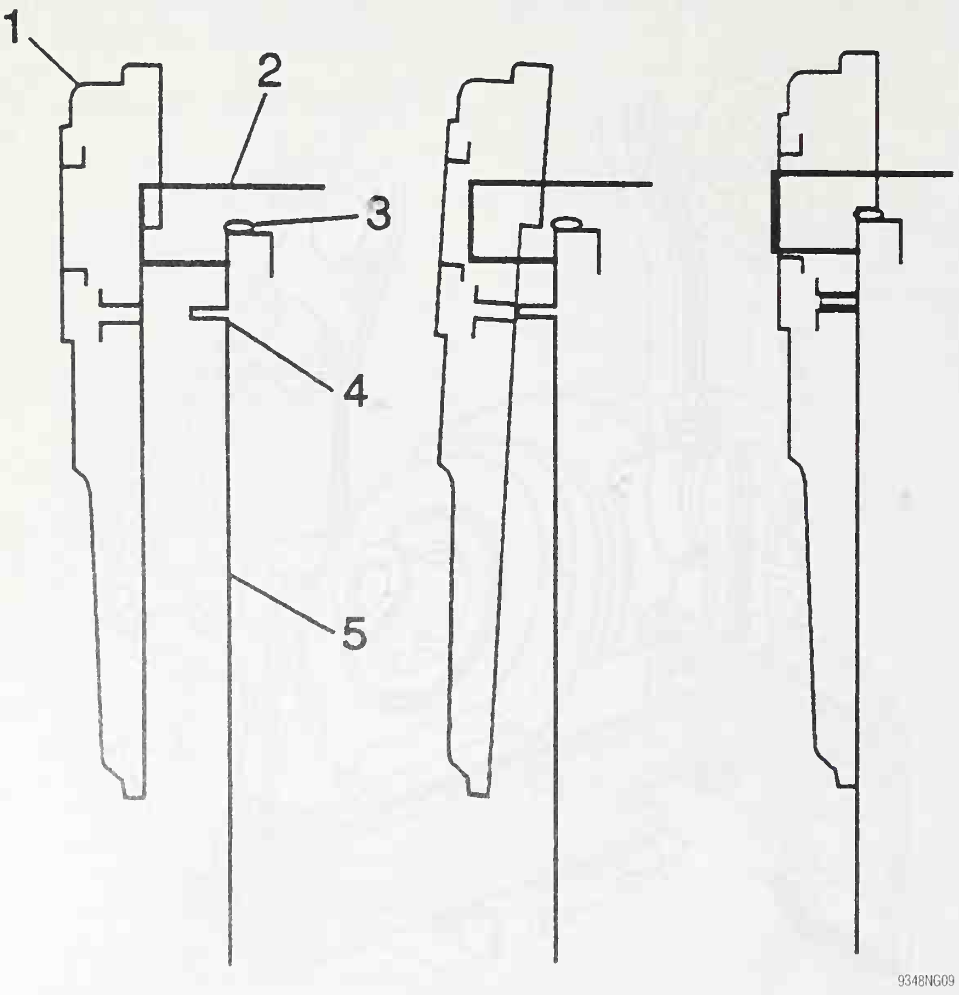
Timing mark alignment—4.8L, 5.3L and 6.0L engines



J41480 installation—4.8L, 5.3L and 6.0L engines



Seal alignment tool installation—4.8L, 5.3L and 6.0L engines



Proper front cover installation sequence—8.1L engine

- Negative battery cable
- Water pump
- Crankshaft balancer from the crankshaft
- Camshaft Position (CMP) sensor connector
- Engine harness clips from the battery cable channel
- CMP sensor bolt and sensor
- Battery cable channel bolt
- Battery cable channel and reposition
- Front cover bolts, front cover and gasket

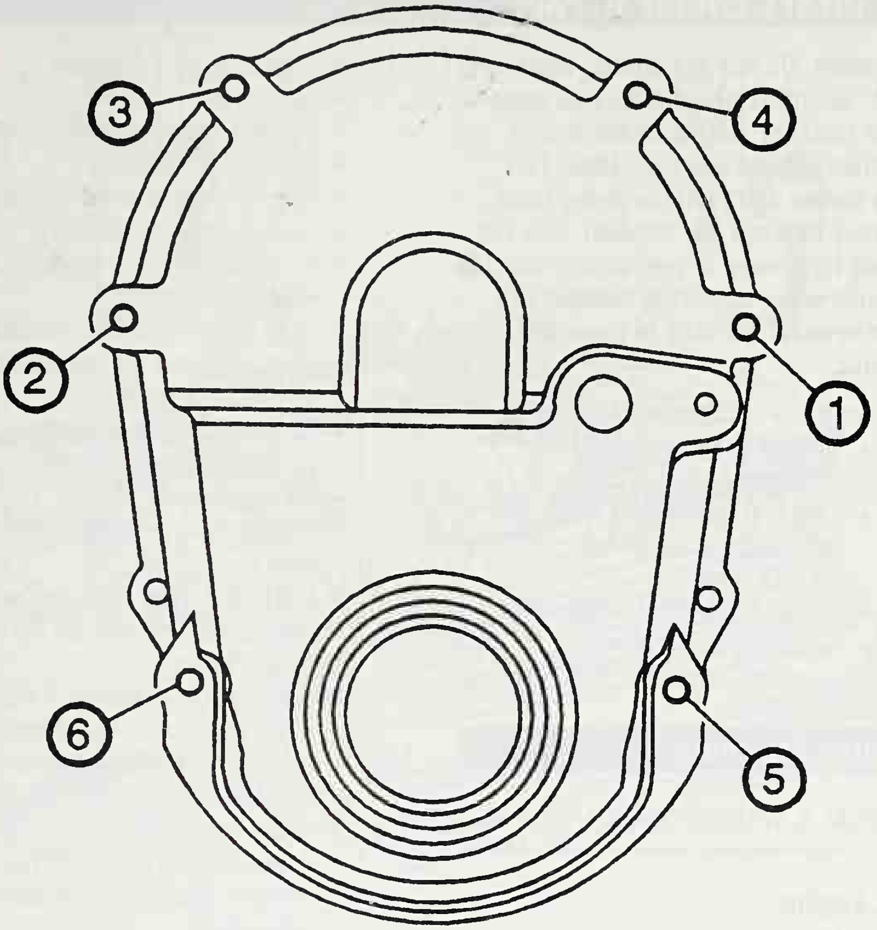
➡The front cover gasket can be reused if it is not damaged.

- Crankshaft front oil seal from the front cover

3. Align the timing marks on the camshaft and crankshaft sprockets.
   - Camshaft sprocket bolts
   - Camshaft sprocket and timing chain
4. Install Crankshaft Protector Button tool No. J 42846 into the end of the crankshaft and remove the crankshaft sprocket using a 3-jawed puller.
5. Clean and inspect the timing chain and sprockets.

To install:

6. Use the Crankshaft Sprocket Installer tool No. J 22102 to install the crankshaft sprocket. Align the keyway of the sprocket with the crankshaft pin.
7. Remove the installation tool.
8. Rotate the crankshaft until the crankshaft sprocket alignment mark is in the 12 o'clock position.
9. Install the camshaft sprocket and timing chain, noting the following important points:
   a. The cam sprocket must be installed with the alignment mark at the 6 o'clock position.
   b. The sprocket teeth must mesh with the timing chain to avoid damaging the camshaft retainer.
   c. Never use a hammer to install the sprocket onto the camshaft.
10. Make sure the crankshaft sprocket is alignment at the 12 o'clock position and the cam sprocket is at the 6 o'clock position.
11. Install the camshaft sprocket bolts and tighten, in two passes, to 22 ft. lbs. (30 Nm)
12. Use clean engine oil to lubricate the sealing surfaces of the front oil seal.
13. Install or connect the following:
    - New seal into the front cover, using a suitable seal installation tool


3
4
2
1
6
5
9348NG10

Engine front cover bolt tightening sequence—8.1L engine

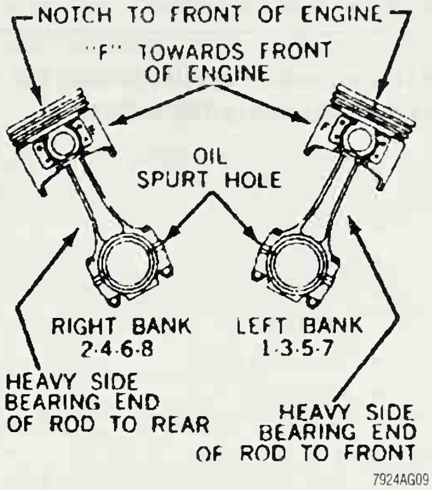
➡The front cover must be installed while the sealant is still wet to the touch.

- Sealant to the 2 places on the engine block where the front cover meets the oil pan
- Front cover gasket into the cover

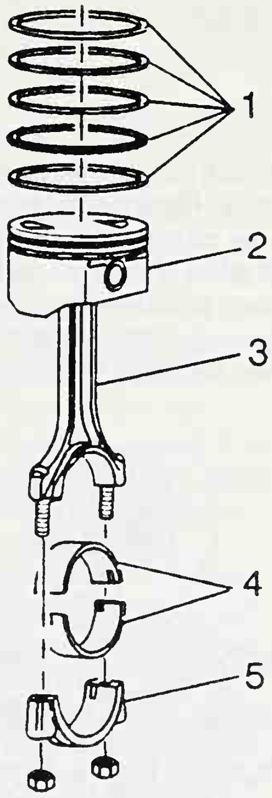
14. Install the front cover, referring to the accompanying figure and using the following steps only:
    a. Hold the front cover (1) up to the crankshaft (2).
    b. Lift the cover (1) while sliding the cover over the crankshaft (2).
    c. Slide the front cover toward the engine block (5) while keeping the cover raised.
    d. Lower the cover down over the dowel pin (4), allowing the front cover to rest on the sealant (3).
15. Install the front cover bolts and tighten, in sequence, as follows:
    a. 1st pass: 53 inch lbs. (6 Nm)
    b. 2nd pass: 106 inch lbs. (12 Nm)
16. Install or connect the following:
    - Battery cable channel and bolt. Tighten to 80 inch lbs. (9 Nm).
    - CMP sensor. Inspect the O-ring first, replace if necessary and coat with oil before installation
    - CMP sensor bolt to 106 inch lbs. (12 Nm)
    - Engine harness clips to the battery cable channel
    - CMP sensor electrical connector
    - Crankshaft balancer
    - Water pump
    - Negative battery cable.
17. Fill the cooling system with the proper type and quantity of antifreeze.

Piston and Ring

POSITIONING


NOTCH TO FRONT OF ENGINE
"F" TOWARDS FRONT OF ENGINE
OIL SPURT HOLE
RIGHT BANK 2-4-6-8
LEFT BANK 1-3-5-7
HEAVY SIDE BEARING END OF ROD TO REAR
HEAVY SIDE BEARING END OF ROD TO FRONT
7924AG09

Piston and connecting rod assembly positioning—4.3L, 4.8L, 5.0L, 5.3L, 5.7L and 6.0L engines


1
2
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9348NG11

Piston rings (1), piston (2), connecting rod (3) and related components—8.1L engine

DIESEL ENGINE REPAIR

Alternator

REMOVAL & INSTALLATION

➡This procedure applies to both the main and auxiliary alternators.

1. Disconnect the negative battery cable.
2. Remove or disconnect the following:
   - Accessory drive belt
   - Engine sight shield, if necessary
   - Electrical connections from the generator
   - Mounting bolts
   - Alternator
3. If necessary, remove the cable from the alternator as follows:
   a. Slide the boot down, to reveal the terminal stud.
   b. Unfasten the cable nut from the stud, then remove the alternator cable.

To install:

4. Connect the alternator cable, secure with the nut and tighten to 80 inch lbs. (9 Nm). Slide the boot back over the terminal stud.
5. Install the generator.

➡Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

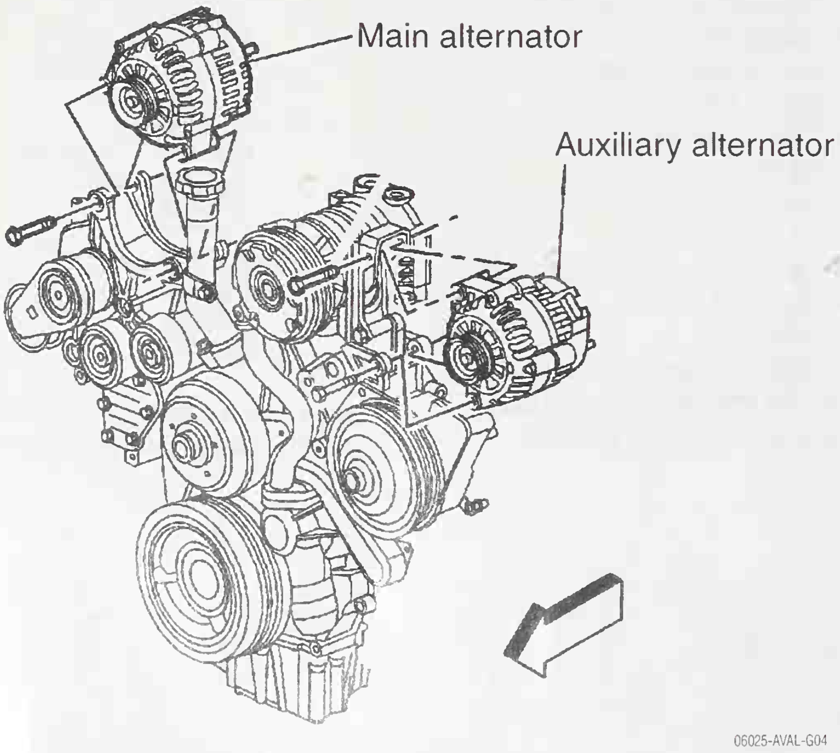
6. Install or connect the following:
   - Alternator mounting bolts and tighten to 37 ft. lbs. (50 Nm)
   - Electrical connections to the alternator. Tighten the B+ nut to 13 ft. lbs. (18 Nm).
   - Engine sight shield, if removed
   - Accessory drive belt
7. Connect the negative battery cable.

Engine Assembly

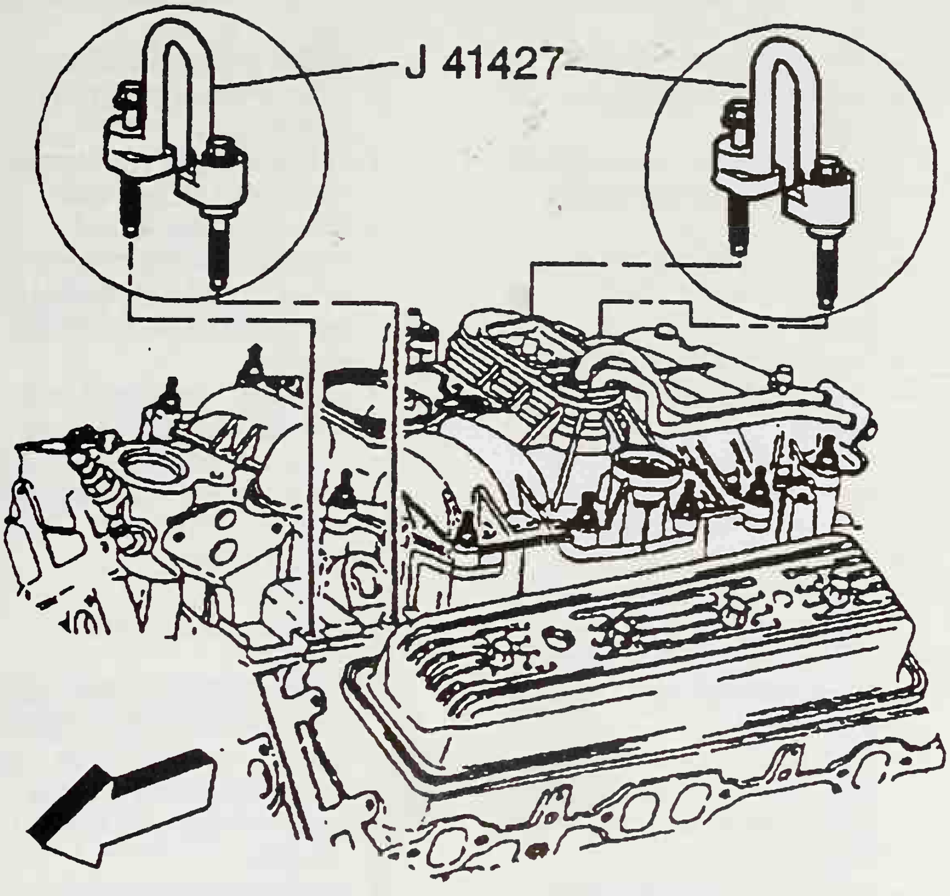
REMOVAL & INSTALLATION

6.5L Engine

1. Drain the cooling system.
2. Discharge the air conditioning system and remove the air conditioning vacuum reservoir.
3. Drain the engine oil.
4. Remove or disconnect the following:
   - Battery cables
   - Engine cover, if equipped
   - Air cleaner
   - Radiator coolant reservoir bottle
   - Upper radiator support
   - Grille and the lower grille valance
   - Front bumper, if necessary
   - Air conditioning condenser from in front of the radiator
   - Fluid cooler lines from the radiator (vans equipped with an automatic transmission only)
   - Radiator hoses at the radiator
   - Radiator support bracket
   - Radiator and the shroud
   - Accelerator and cruise control linkages
   - Hoses and wires at the fuel unit
   - Fuel supply unit and cap the lines
   - Intake manifold
   - Turbocharger assembly, if equipped
   - Lower intake manifold, if equipped
   - Exhaust manifolds, if necessary
   - Engine wiring harness from the firewall connection
   - Power steering pump, it's not necessary to disconnect the hoses; just move aside
   - Heater hoses at the engine
   - Thermostat housing, if necessary
   - Oil filler and automatic transmission tubes
   - Cruise control servo, servo bracket and transducer, if equipped
   - Exhaust pipes at the manifolds
   - Driveshaft and plug the end of the transmission
   - Transmission shift linkage and the speedometer cable
   - Fuel line from the fuel tank and pump
   - Transmission mounting bolts
5. Support the transmission and engine.
6. Install lifting hooks J-41427 as follows:
   a. Remove the 2 right rear lower intake manifold retainers and install lifting hook J-41427 (the one marked "right"). Tighten the bolts to 11 ft. lbs. (15 Nm).
   b. Remove the air conditioning compressor and the accessory drive bracket.
   c. If equipped, disconnect the EGR tube and the 2 left lower bolts from the intake manifold.
   d. Install the lifting hook J-41427 (the one marked "left") and tighten the bolts to 11 ft. lbs. (15 Nm).
7. Remove or disconnect the following:



[illegible] auxiliary alternator mounting



For engine removal and installation, universal lift brackets should be installed in place of the proper intake manifold bolts

- Engine mount bracket-to-frame bolts
- Engine mount through-bolts

8. Raise the engine slightly and remove the engine mounts, support the engine with wood between the oil pan and the crossmember.

9. Remove the manual transmission and clutch as follows:

   a. Remove the clutch housing rear bolts.

   b. Remove the bolts attaching the clutch housing to the engine and remove the transmission and clutch as a unit.

➡Support the transmission as the last bolt is being removed to prevent damaging the clutch.

   c. Remove the starter and clutch housing rear cover.

   d. Loosen the clutch mounting bolts a little at a time to prevent distorting the disc until spring pressure is released. Remove all of the bolts, the clutch disc and the pressure plate.

10. Remove the automatic transmission as follows:

   a. Lower the engine and support it on blocks.

   b. Remove the starter and converter housing cover.

   c. Remove the flexplate-to-converter attaching bolts.

   d. Support the transmission on blocks.

   e. Disconnect the detent cable on the Turbo Hydra-Matic.

   f. Remove the transmission-to-engine mounting bolts.

11. Attach an engine crane to the engine.

12. Remove the blocks from the engine only and glide the engine away from the transmission.

To install:

13. Install the manual transmission and clutch as follows:

   a. Install the clutch disc and the pressure plate. Tighten the clutch mounting bolts a little at a time to prevent distorting the disc.

   b. Install the starter and clutch housing rear cover.

   c. Install the bolts attaching the clutch housing to the engine and install the transmission and clutch as a unit. Tighten the bolts to specification.

   d. Install the clutch housing rear bolts.

14. Install the automatic transmission as follows:

   a. Position the transmission.

   b. Install the transmission-to-engine mounting bolts.

   c. Connect the throttle linkage and detent cable.

   d. Install the flexplate-to-converter attaching bolts. Torque the bolts to 65 ft lbs. (90 Nm).

   e. Install the starter and converter housing cover.

15. Install or connect the following:
   - Engine mount through-bolts and tighten to 50 ft lbs. (68 Nm)
   - Engine mount bracket-to-frame bolts. Torque the bolts to 44 ft lbs. (59 Nm).
   - Clutch cross-shaft
   - Transmission mounting bolts and tighten to 75 ft lbs. (100 Nm)
   - Transmission shift linkage and the speedometer cable
   - Driveshaft
16. Remove the lifting hooks.
   - Compressor
   - EGR valve tube
   - Intake manifold retaining bolts
   - Condenser
   - Hood latch support
   - Lower fan shroud and filler panel
   - Transmission dipstick tube and the accelerator cable at the tube
   - Coolant hose at the intake manifold and the PCV valve
   - Cruise control servo, bracket and transducer
   - Oil filler pipe and automatic transmission filler pipe
   - Engine dipstick tube
   - Thermostat housing, if removed
   - Heater hoses at the engine
   - Engine wiring harness to the firewall connection
   - Radiator and the shroud
   - Radiator support bracket
   - Exhaust manifolds if removed
   - Lower intake manifold if removed
   - Intake manifold
   - Fuel supply unit
   - Lines to the fuel supply unit
   - Accelerator and cruise control linkages
   - Windshield wiper jar and bracket
   - Air conditioning condenser
   - Air conditioning vacuum reservoir, if equipped
   - Fluid cooler lines at the radiator, if equipped with an automatic transmission
   - Radiator coolant reservoir bottle
   - Hoses at the radiator
   - Upper radiator support
   - Grille and the lower grille valance

- Air cleaner
- Air stove pipe
- Engine cover
- Battery cables

17. Refill the cooling system.

18. Recharge the air conditioning system.

6.6L Engine

➡In order to remove the engine, the vehicle must be on a lift. the front tires also need to be removed. You will have to support the vehicle by its frame for tire removal.

1. Drain the cooling system.

2. Discharge and recover the air conditioning system.

3. Drain the engine oil.

4. Raise the hood to the servicing position. Move the hood hinge bolt to hold the hood in the servicing position.

5. Disconnect the battery cables.

6. Remove the upper intake manifold sight shield as follows:

    a. Remove the retaining bolt in the front of the shield.

    b. Lift up on the front of the shield, then left the shield off the rear bracket.

7. Remove or disconnect the following:

➡After you remove the duct, cover the turbocharger openings and ducts with tape to prevent foreign objects from entering.

- Air cleaner outlet duct from the air cleaner and turbocharger.
- Mass Air Flow (MAF) switch connector
- A/C pressure cycling switch connector
- Surge tank switch
- Engine wire harness clip from the accumulator
- Engine wire harness clips from the wheelhouse inner panel and engine bracket
- Air cleaner assembly and bracket
- Surge tank

8. Raise the vehicle.

- Front tires and wheels
- Both front fender wheelhouse inner panels

9. Lower the vehicle.

- Charged air cooler pipes and hoses from the engine and charged air cooler
- Radiator inlet hose form the radiator and engine
- Upper and lower fan shrouds
- Radiator outlet hose from the radiator
- Outlet heater hose from the outlet radiator hose
- Hose clips from the frame
- Radiator outlet hose from the engine
- Bolt securing the outlet heater hose pipe to the alternator mounting bracket
- Nut securing the outlet heater hose pipe to the fuel filter mounting bracket
- Secure the heater hose aside
- Upper radiator support
- Radiator
- Charged air cooler
- A/C condenser
- Alternator harness connector
- A/C refrigerant switch connector
- Dual alternator harness connector, if equipped
- A/C compressor clutch connector
- Harness clip from the A/C compressor bracket
- Battery cable from the alternator and auxiliary alternator, if equipped
- Battery cable harness clips from the bracket
- Bolt securing the battery cable junction block from the power steering pump
- Move and secure the battery cables aside
- Both fuel injection control module harness connectors, by flipping the latch up
- Engine wire harness from the retainer
- Fuel lines at the engine
- Remove the nut and the fuel line bracket from the upper valve rocker arm cover stud
- Fuel lines aside
- Power supply cable from the glow plug relay
- Drive belt
- Suction hose from the accumulator. You can leave the compressor end on the compressor.
- A/C compressor bolts, then move the compressor, with the hoses attached, to the right side of the engine compartment
- Wiring harness to the left side of the engine and tie aside
- Bolts holding the power steering pump front bracket to the pump and A/C compressor mounting bracket
- A/C compressor and power steering pump bracket. Once the battery cables are removed from the engine, the power steering pump can be removed further out of the way
- Positive Crankcase Ventilation (PCV) oil separator from the bracket
- Bolts securing the PCV separator bracket and fuel bleed valve
- Right idler pulley (ribbed)
- Alternator mounting bracket and secure aside. You do not have to remove the alternator or the belt tensioner
- Inlet heater hose from the heater core inlet, using Quick Connect-Disconnect tool No. J 43181
- Bolt and ground wires from the rear of the left cylinder head

10. Raise the vehicle

- Oil pan skid plate
- Engine protection shield, if equipped
- Bolt for the negative battery cable and engine wiring harness ground wire from the left side of the engine
- Bolts holding the battery cable channel retainer to the lower crankcase
- Engine coolant heater cord
- Starter motor
- Nut securing the battery cable bracket to the right side of the lower crankcase
- Bolt holding the auxiliary negative battery cable and the engine wiring harness ground wires to the right side of the engine
- Position the battery cables aside
- Exhaust pipe-to-exhaust outlet clamp
- Lower oil pan, if 4WD

11. If equipped with an automatic transmission, matchmark the installed position of the flywheel and torque converter.

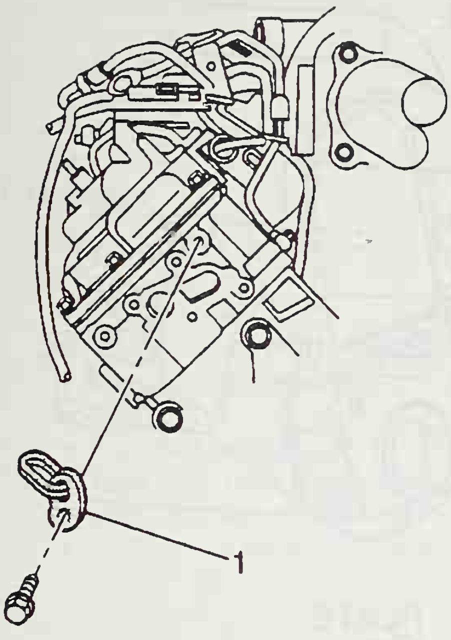
- Torque converter bolts through the starter opening
- Transmission oil line clip nut if equipped with A/T
- Nuts securing the transmission fluid fill tube bracket, if equipped with A/T
- Transmission-to-engine stud and bolts. Note the location of the studs and any brackets attached to the studs

12. Lower the vehicle to work through the wheel opening

- Engine mount-to-frame bracket bolts

13. Lower the vehicle.

14. Install Engine Lifting Bracket tool No. J 36857 to the rear of the left cylinder head with a suitable bolt.



Install the engine lifting bracket to the rear of the left cylinder head

15. Install Engine Lifting Bracket tool No. J 36857 to the front of the right cylinder head with a suitable bolt.

16. Install a suitable lifting device. The engine will have to be angled to remove it. Use a load positioning sling to help in angling the engine.

17. Raise the vehicle off the engine mounts.

18. Remove the left and right engine mount frame brackets.

19. Remove the engine assembly from the vehicle.

20. Secure the engine on an engine stand by removing the following components:
    - Flywheel/flexplate
    - Rear main seal
    - Exhaust outlet
    - Oil pan
    - Flywheel housing

To install:

21. Install Engine Lifting Bracket tool No. J 36857 to the rear of the left cylinder head with a suitable bolt.

22. Install Engine Lifting Bracket tool No. J 36857 to the front of the right cylinder head with a suitable bolt.

23. Install a suitable lifting device. The engine will have to be angled to install it. Use a load positioning sling to help in angling the engine.

24. Install or connect the following:
    - Engine in the vehicle
    - 2 transmission-to-engine bolts, loosely
    - Left and right side engine mount frame brackets and tighten to 55 ft. lbs. (75 Nm)
    - Engine mount-to-frame bracket bolts and tighten to 50 ft. lbs. (65 Nm)

25. Remove the lifting brackets from the cylinder heads.
    - Transmission-to-engine bolts/studs and tighten to 37 ft. lbs. (50 Nm)
    - Torque converter bolts and tighten to 44 ft. lbs. (60 Nm)

26. Install the remaining components in the reverse of the removal procedure, noting the following important specifications and steps:
    - Transmission fluid tube bracket nuts: 13 ft. lbs. (18 Nm)
    - Transmission oil cooler line clip bolt: 80 inch lbs. (9 Nm)
    - Exhaust pipe clamp: 30 ft. lbs. (40 Nm)
    - Ground wire bolt: 25 ft. lbs. (34 Nm)
    - Battery cable bracket bolts: 106 inch lbs. (12 Nm)
    - Cable and ground wire bolts: 25 ft. lbs. (34 Nm)
    - Oil pan skid plate bolts: 15 ft. lbs. (20 Nm)
    - Engine protection shield bolts: 15 ft. lbs. (20 Nm)
    - Alternator bracket bolt: 37 ft. lbs. (50 Nm)
    - Idler pulley bolt: 32 ft. lbs. (43 Nm)
    - A/C compressor bolts: 37 ft. lbs. (50 Nm)

27. Refill the crankcase and the cooling system.

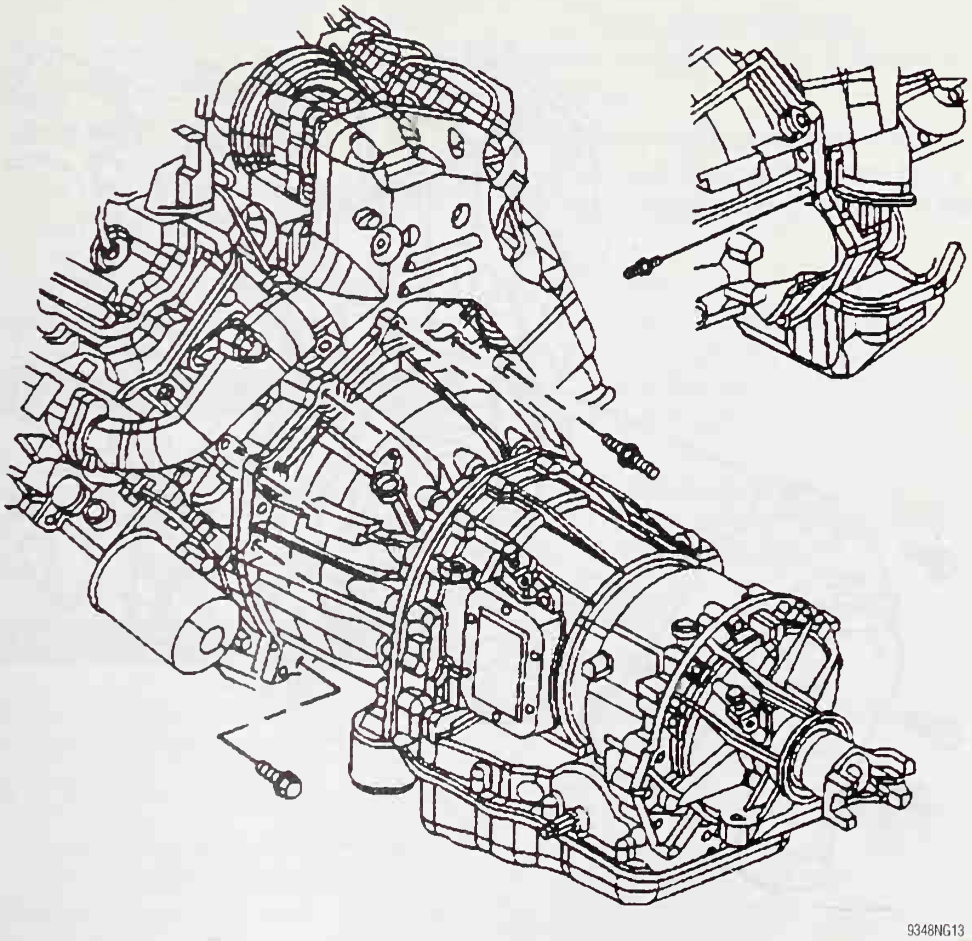
28. Recharge the air conditioning system.

Water Pump

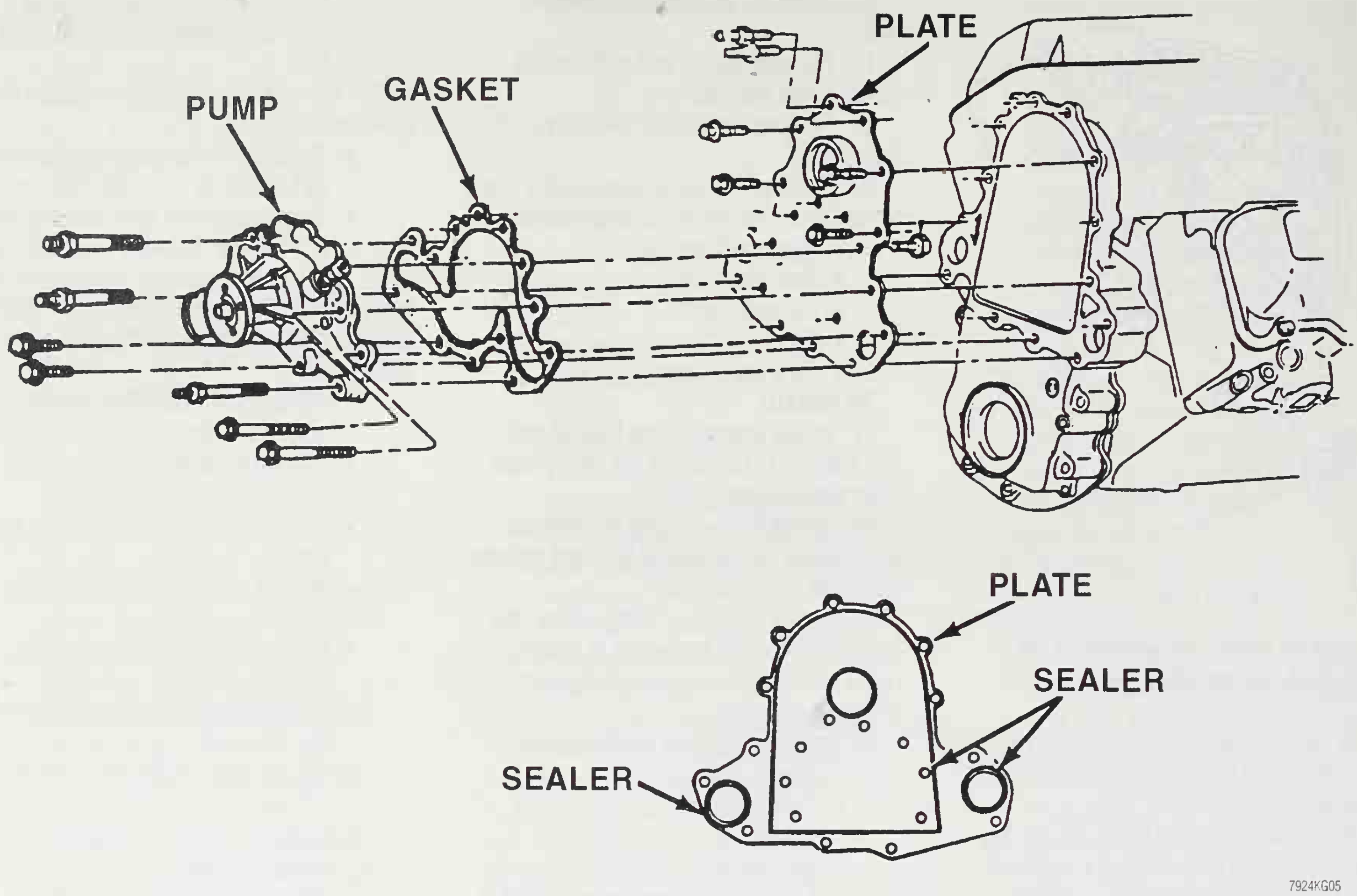
REMOVAL & INSTALLATION

6.5L Engine

1. Drain the engine coolant.
2. Remove or disconnect the following:
    - Negative battery cables
    - Fan and fan shroud
    - Air conditioning hose bracket and/or the oil filler tube, as required
    - Accessory drive belt(s)
    - Vacuum pump mounting bracket nuts/bolt
    - Vacuum pump and bracket
    - Power steering pump and bracket
    - Coolant hoses from the pump
    - Water pump plate retaining bolts
    - Pump and plate assembly from the engine



Transmission-to-engine mounting—6.6L engine with A/T



Exploded view of the water pump assembly and related components—6.5L diesel engines

➡Remove the bolt on the rear of the water pump plate.

- Separate the pump and gasket from the plate

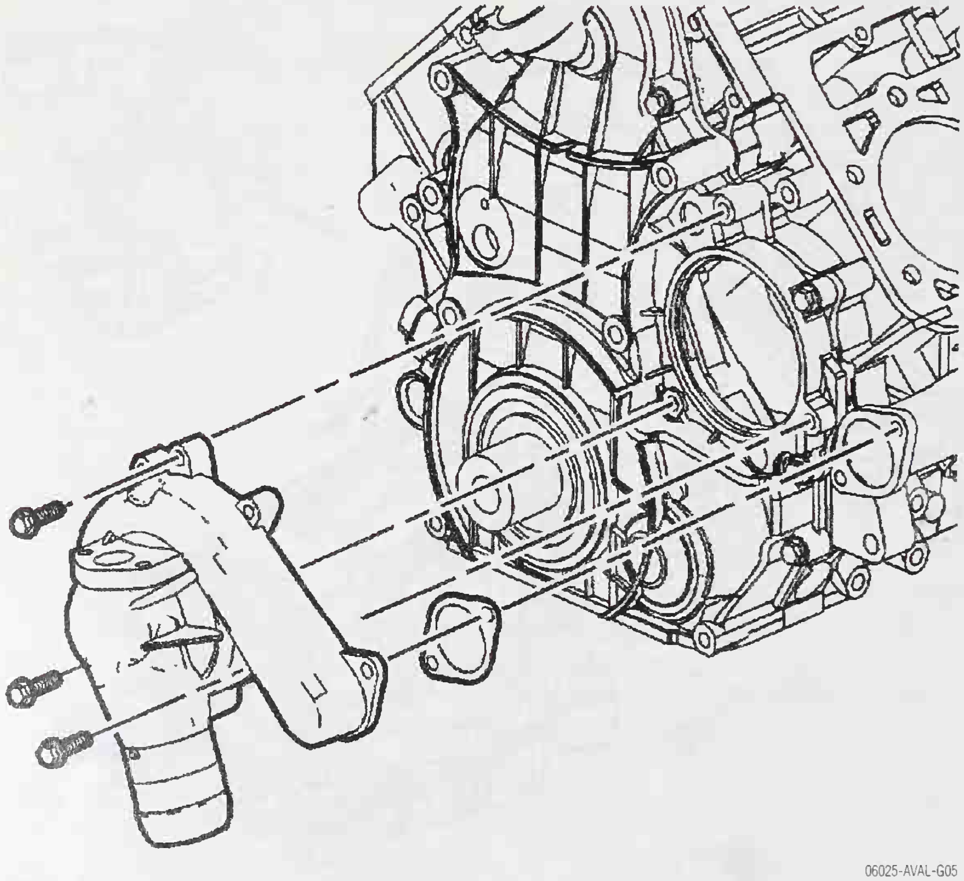
To install:

3. Install or connect the following:
   - Water pump and a new gasket to the plate. Torque the retaining bolt (at the rear of the plate) to 20 ft. lbs. (28 Nm).

4. Be sure the block mating surface and the plate flanges are free of oil. Apply an anaerobic sealer GM part 1052357 or equivalent.

➡The sealer must be wet to the touch when the bolts are tightened.

- Water pump and plate assembly. Torque the bolts to 20 ft. lbs. (28 Nm).
- Coolant hoses to the pump assembly
- Power steering pump and bracket
- Vacuum pump and bracket, along with the bolt holding the pump and alternator
- Fan and pulley
- Accessory drive belt(s)
- Oil filler tube and/or air condi-



Exploded view of the water pump assembly and related components—6.6L diesel engines

- tioning hose bracket nuts, if removed
- Fan shroud
- Batteries

5. Refill the radiator.

6.6L Engine

1. Remove the left front fender wheelhouse inner panel.
2. Drain the coolant.
3. Remove or disconnect the following:
   - Thermostat housing crossover
   - Fan clutch
   - Crankshaft balancer
   - Water pump outlet pipe-to-water pump nuts
   - Engine wiring harness retainer front the inner stud
   - Water pump bolts, noting their locations as they are different lengths
   - Water pump and gasket

To install:

4. Lubricate the water pump O-ring with engine oil.
5. Install or connect the following:
   - Water pump
   - Water pump bolts and tighten to 15 ft. lbs. (20 Nm)
   - Water pump-to-water pump outlet gasket
   - Engine wiring harness retainer on the water pump outlet pipe inner stud
   - Water pump-to-water pump outlet pipe nuts and tighten to 15 ft. lbs. (20 Nm)
   - Thermostat housing crossover
   - Crankshaft balancer
   - Fan clutch
6. Fill the cooling system and install the left front fender wheelhouse inner panel.

Heater Core

REMOVAL & INSTALLATION

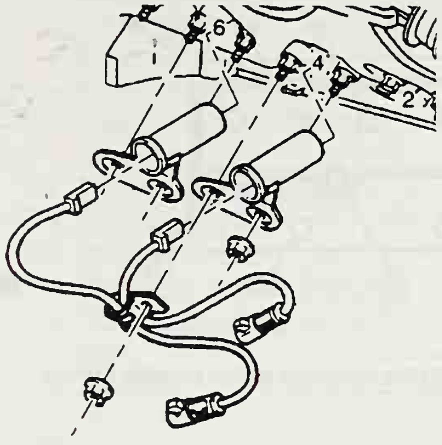
Please refer to Heater Core under Gasoline Engine Repair for this procedure.

Glow Plugs

REMOVAL & INSTALLATION

6.5L Engine

1. Remove or disconnect the following:
   - Negative battery cables
   - Glow plug lead wires
   - Plugs



Exploded view of the heat shrouds and glow plug wiring—6.5L diesel engine

   - Right front tire
   - Inner splash shield from the fender well
   - Lead wire from the plug at the No. 2 cylinder and the lead wires from plugs in the Nos. 4 and 6 cylinders at the harness connectors
   - Heat shroud for the plug in the No. 4 and 6 cylinder. Slide the shrouds back just far enough to allow access so you can unplug the wires.
   - Glow plugs in cylinders No. 2, 4 and 6.
2. Reach up under the vehicle and disconnect the lead wire at No. 8. Remove the glow plug.

➡You may find that removing the exhaust pipe down might make this a bit easier when working on Nos. 6 and 8.

To install:

3. Install or connect the following:
   - Glow plugs and tighten to 16 ft. lbs. (22 Nm)
   - Heat shrouds and electrical connection
   - Exhaust pipe, if removed
   - Splash shields, if removed
   - Negative battery cable

6.6L Engine

BANK 1 OR 2

1. Remove or disconnect the following:
   - Negative battery cables
   - Front tire
   - Inner splash shield from the fender well
   - Air cleaner outlet duct
   - Electrical nuts from the glow plug(s)
   - Harness from the glow plug(s)

➡On vehicles with Federal emissions systems, there is a buss bar connecting the glow plugs on each bank of the engine.

   - Glow plug(s)

To install:

2. Install or connect the following:
   - Glow plug and tighten to 13 ft. lbs. (18 Nm)
   - Buss bar and wiring
   - Glow plug electrical nut and tighten to 13 inch lbs. (1.5 Nm)
   - Air cleaner outlet duct
   - Splash shield to the fender well
   - Negative battery cables

Cylinder Head

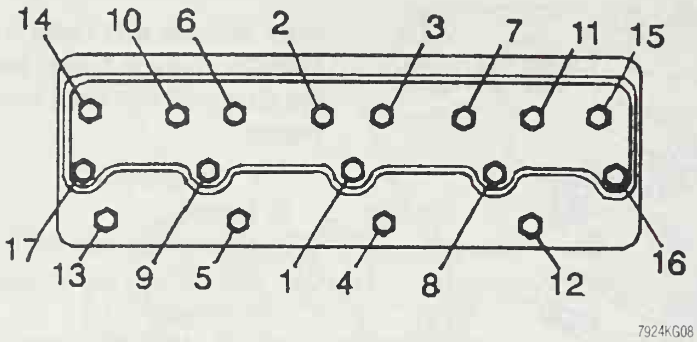
REMOVAL & INSTALLATION

6.5L Engine

1. Relieve the fuel system pressure.
2. Drain the coolant system.
3. Discharge the air conditioning system.
4. Remove or disconnect the following:
   - Negative battery cables
   - Intake manifold
   - Fan upper shroud
   - Compressor assembly, if equipped
   - Turbocharger, if equipped
   - Exhaust manifold
   - Valve cover
   - Rocker arm assemblies and pushrods

➡Mark all components so they may be returned to their original location.

   - Air cleaner resonator and bracket
   - Transmission and oil dipstick tube; remove the oil fill tube from the coolant crossover pipe
   - Heater, radiator and bypass hoses
   - Alternator upper bracket
   - Alternator
   - Power steering pump
   - Vacuum pump
   - Fuel bleeder valve at the coolant crossover pipe
   - Fuel return crossover line clamp bolts from both cylinder heads
   - Wire connector from the sensor in the coolant crossover pipe
   - Electrical connection and brackets from cylinder head
   - Coolant crossover pipe/thermostat assembly
   - Head bolts and the cylinder heads



Tighten the cylinder head bolts according to the sequence shown for proper cylinder sealing—6.5L diesel engines

To install:

5. Clean the mating surfaces of the heads and block thoroughly.

6. Clean the head bolts thoroughly. Coat the threads of the head bolts with sealing compound GM part 1052080 or equivalent, before installation.

7. Install a new gaskets, and the cylinder head and bolts. Torque the bolts, in sequence, as follows:

a. Step 1: 20 ft. lbs. (25 Nm)

b. Step 2: 50 ft. lbs. (65 Nm).

c. Step 3: An additional 90 degrees (¼ turn).

8. Install or connect the following:

- Coolant crossover pipe and thermostat
- Fuel valve
- Bypass hose
- Upper radiator hose
- Heater hoses at the head
- Transmission and oil dipstick tube
- Air cleaner resonator and bracket
- Pushrods, hardened ends facing up
- Rocker arm assemblies

9. Adjust the valves.

- Valve cover
- Alternator and upper bracket
- Exhaust manifolds. Torque bolts to 22 ft. lbs. (30 Nm).
- Upper fan shroud
- Intake manifold
- Turbocharger, if equipped
- Vacuum pump, if equipped
- Air conditioning compressor, if equipped
- Engine electrical connection
- Negative battery cables

10. Refill the cooling system with the proper type and quantity of antifreeze.

11. Evacuate and recharge the air conditioning system.

6.6L Engine

1. Relieve the fuel system pressure.
2. Drain the coolant system.
3. Remove or disconnect the following:

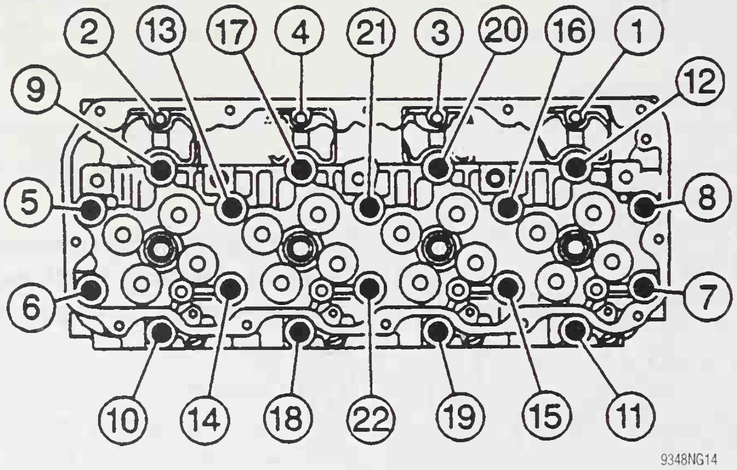
- Negative battery cables
- Left or right front splash shield from the fender well, as applicable
- Turbocharger
- Turbocharger charged air cooler inlet duct
- Thermostat housing crossover
- Left or right intake manifold, as necessary
- Upper left or right valve cover
- Fuel rail assembly
- Left or right exhaust manifold
- Bolt and ground straps from the rear of the cylinder head
- Lower left or right valve cover
- Rocker arm shaft assembly
- Glow plugs
- Fuel injector return pipe eye bolts and washers
- Fuel injector return pipe assembly
- Fuel injector bracket bolts
- Fuel injectors with the brackets, using a suitable removal tool
- Injector bracket pins
- Cylinder head bolts, in the proper sequence
- Cylinder head and gasket. Discard the gasket

To install:

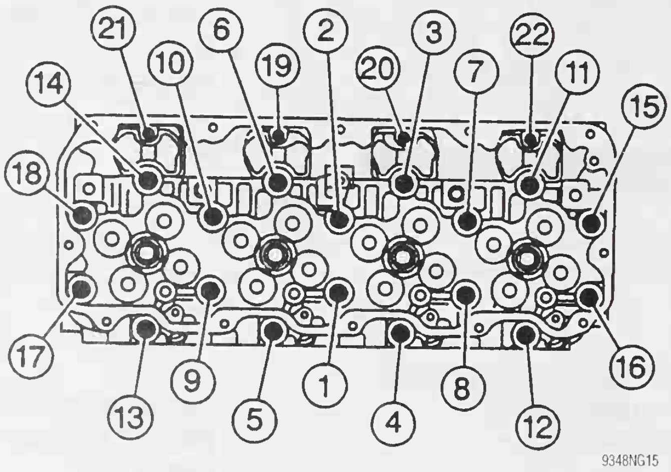
4. Clean the mating surfaces of the heads and block thoroughly.

5. Position a new left or right side head gasket on the block. Note that the left and right side gaskets are NOT interchangeable.

➡The cylinder head bolts on these vehicles are pre-coated with an application of a molybdenum disulfide for thread lubrication. Do not remove the coating or add any additional lubrication.



Cylinder head bolt loosening sequence—6.6L diesel engine



Cylinder head bolt tightening sequence—6.6L diesel engines

6. Install the cylinder head and bolts.

7. Tighten the cylinder head bolts, in sequence, as follows:

   a. Step 1: M12 bolts to 37 ft. lbs. (50 Nm).

   b. Step 2: M12 bolts to 59 ft. lbs. (80 Nm).

   c. Step 3: Tighten the M12 bolts an additional 90 degrees using a torque angle meter.

   d. Step 4: Tighten the M12 bolts an additional 75 degrees using a torque angle meter.

   e. Step 5: M8 bolts to 18 ft. lbs. (25 Nm).

8. Install or connect the following:
   - New O-ring onto the fuel injectors after coating with clean engine oil
   - New copper washer into the fuel injector bore in the cylinder head
   - Fuel injector bracket pin

➡If you are reusing the old injectors, clean the carbon from the tips, but do not use a wire brush.

- Fuel injector bracket bolt and tighten to 37 ft. lbs. (50 Nm)
- Fuel injector return pipe assembly
- Fuel injector return pipe-to-injector eye bolts and washers. Tighten to 11 ft. lbs. (15 Nm).
- Fuel return pipe-to-cylinder head eye bolts and washers. Tighten to 11 ft. lbs. (15 Nm).
- Bolt and ground straps to the rear of the cylinder head. Tighten to 18 ft. lbs. (25 Nm).
- Valve rocker shaft assembly
- Lower and upper valve covers
- Glow plugs
- Exhaust manifold
- Fuel rail assembly
- Intake manifold
- Thermostat housing crossover
- Turbocharger charged air cooler duct
- Clamp and hose to the charged air cooler. Tighten to 53 inch lbs. (6 Nm).
- Turbocharger
- Fender splash shield
- Negative battery cables

9. Refill the cooling system with the proper type and quantity of antifreeze.

10. Evacuate and recharge the air conditioning system.

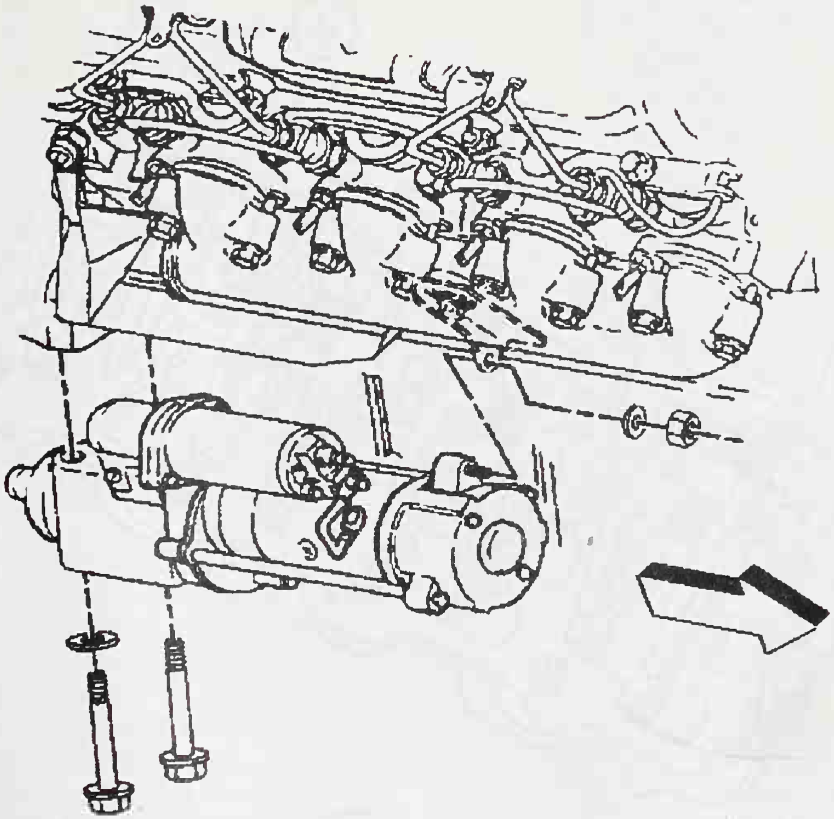
Starter Motor

REMOVAL & INSTALLATION

1. Remove or disconnect the following:
   - Negative battery cables
   - Right front wheel and fender splash shield, on 6.6L engines
   - Turbocharger exhaust pipe, on 6.6L engines
   - Mounting bolts/nuts and shim, if used
   - Starter
   - Wires
   - Heat shield and bracket

To install:

2. Install or connect the following:
   - Heat shield and bracket. Torque the bolts to 13 ft lbs. (17 Nm).
   - Wires. Torque battery wire nut to 89 inch lbs. (10 Nm), and ignition nut to 18 inch lbs. (2 Nm) on 6.5L engines. On 6.6L engines, tighten the solenoid nut to 30 inch lbs. (3.4 Nm) and the positive battery cable nut to 80 inch lbs. (9 Nm).
   - Starter
   - Mounting bolts/nuts and shim, if used. Torque the bolts to 33 ft lbs. (45 Nm) and the nut to 75 inch lbs. (8.5 Nm) for 6.5L engines. For 6.6L engines tighten the starter bolts to 58 ft. lbs. (78 Nm).
   - Turbocharger exhaust pipe, on 6.6L engines
   - Right front fender splash shield and wheel, on 6.6L engines
   - Negative battery cables



Exploded view of the starter motor—6.5L engine shown

Rocker Arms/Shaft

REMOVAL & INSTALLATION

6.5L Engine

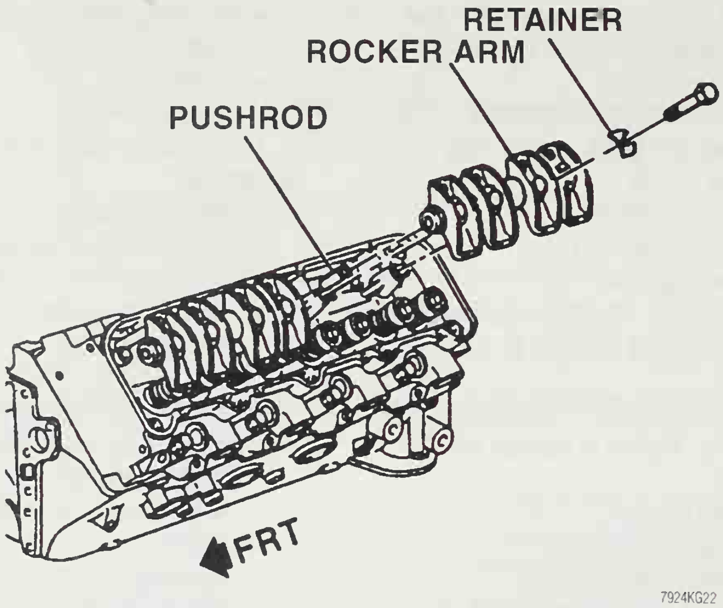
1. Remove or disconnect the following:
   - Engine cover

➡Rotate the engine until the mark on the crankshaft balancer is at the 2 o'clock position. Rotate the crankshaft counterclockwise 3½ in. (88mm) aligning the crankshaft balancer mark with the first lower water pump bolt, at about the 12:30 position. This will ensure that no valves are close to a piston crown.

- Cylinder head cover
- Rocker shaft assembly

➡The rocker assemblies are mounted on 2 short rocker shafts per cylinder head, with each shaft operating 4 rockers. 2 bolts secure each rocker shaft assembly, Mark the shafts so they can be installed in their original locations.

- Pushrods. The pushrods MUST be installed in the original direction! A paint stripe usually identifies the upper end of each rod, but if you can't see it, be sure to mark each rod yourself.



Rocker shaft assembly and related components—diesel engines

2. Insert a small prybar into the end of the rocker shaft bore and break off the end of the nylon retainers. Pull off the retainers with pliers, then slide off the rockers.

To install:

3. Be sure first that the rocker arms and springs go back on the shafts in the exact order in which they were removed. It's a good idea to coat them with engine oil.

4. Center the rockers on the corresponding holes in the shaft

5. Install or connect the following:

- New plastic retainers using a ½ in. (13mm) drift
- Pushrods with there marked ends up
- Rocker shaft assemblies and be sure that the ball ends of the pushrods seat themselves in the rockers

6. Rotate the engine clockwise until the mark on the torsional damper aligns with the **0** on the timing tab. Rotate the engine counterclockwise 3 ½ in. (88mm) measured at the damper. You can estimate this by checking that the mark on the damper is now aligned with the FIRST lower water pump bolt. BE CAREFUL! This ensures that the piston is away from the valves.

- Rocker shaft bolts and tighten to 40 ft. lbs. (55 Nm)
- Cylinder head cover
- Engine cover

6.6L Engine

1. Remove the lower valve (rocker arm) cover.

2. Loosen the valve clearance lock nuts on each rocker arm.

3. Loosen the valve clearance adjusting screw on each rocker arm to relieve tension on the valve train

➡The rocker arm bolts retain the rocker arms on the shaft. Do not remove the bolts from the rocker arm shaft brackets.

4. Loosen the rocker arm shaft bolts in the proper sequence, leaving the bolts in the rocker arm shaft brackets.

5. Remove or disconnect the following:

- Rocker arm shaft assemblies from the cylinder head
- Valve bridge pins
- Valve bridges
- Valve push rods

6. Clean all parts in a suitable solvent. Disassemble the rocker arm shaft as necessary.

To install:

7. Lubricate the rocker arm shaft and the inside of the rocker arms with engine oil.

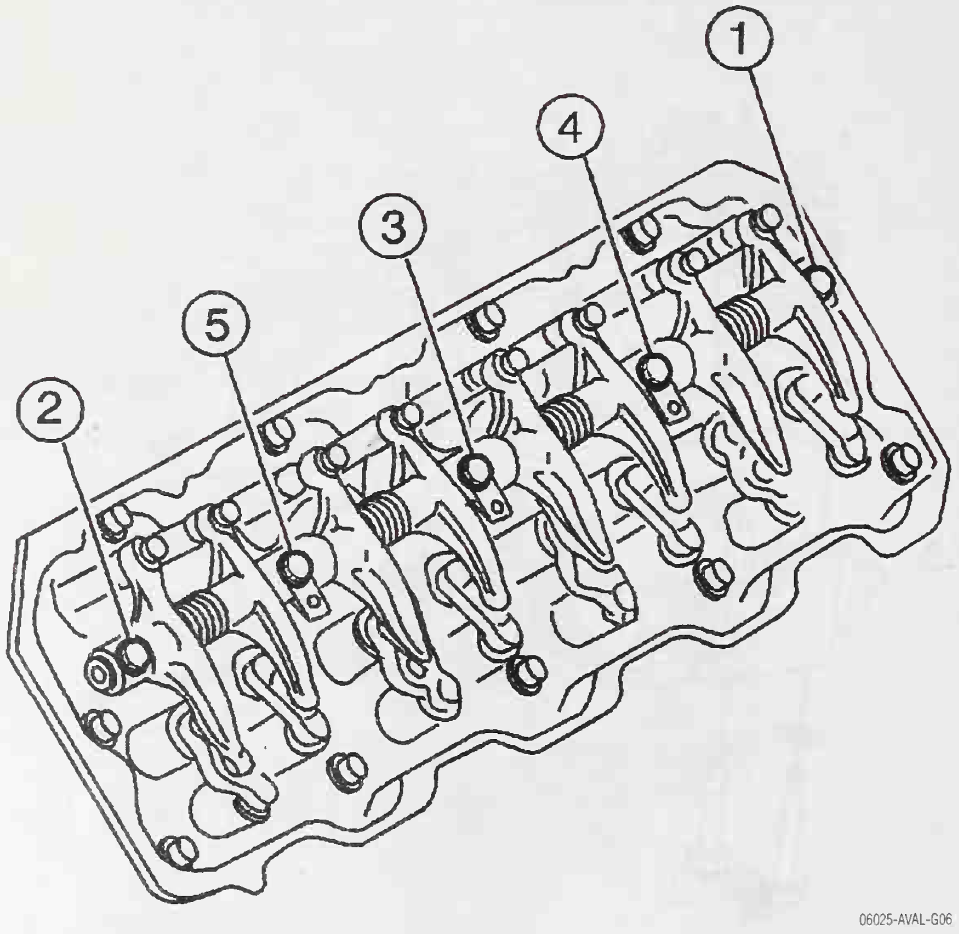
8. If disassembled, install or connect the following:

- Rocker arm bracket on one end of the rocker arm shaft with the bolt
- Rocker arm intake, spring, exhaust and the bracket with bolt. Continue in the same sequence to the last bracket.
- Push the bracket to compress the springs and then install the bolt

9. Lubricate the top of the valves, the valve bridge stem, the valve bridge and the valve bridge pins.

10. Install or connect the following:

- Valve bridge pins
- Valve bridges



Rocker arm shaft bolt loosening sequence—6.6L engine

- Pushrods. Make sure it is fully installed by gently pulling up on it. You should feel resistance from the pushrod trying to lift the valve lifter

11. Use clean engine oil to lubricate the rocker arm shaft bolt threads, tops of the push rods, rocker arms and rocker arm shaft.

- Rocker arm shaft assembly to the cylinder head
- Rocker arm shaft assembly bolts and tighten, in the proper sequence to 30 ft. lbs. (40 Nm)

12. Adjust the valve clearance, as follows:

a. Remove the fan clutch.

b. Remove both upper valve covers.

c. Rotate the engine in the normal direction and place the No. 1 piston at Top Dead Center (TDC) of the compression stroke. The No. 1 cylinder is at the right side front. While turning the engine, watch the intake valve to open and close. Align the mark on the crankshaft balancer with the pointer on the engine.

d. Loosen the valve clearance adjusting screws for the valve being adjusted.

e. Insert the feeler gauge between the tip of the rocker arm and the valve bridge.

f. Adjust the intake and the exhaust valve clearance to 0.012 in. (0.3mm) with the engine cold. Refer to the figure for the valves that can be adjusted TDC of the compression stroke.

g. Tighten the valve adjusting screw lock nut to 16 ft. lbs. (22 Nm).

h. Turn the engine one rotation in the normal direction and put the No. 1 piston at TDC of the exhaust stroke to adjust the remaining valve clearance. While turning the engine, watch the exhaust valve to open and close. Align the mark on the crankshaft balancer with the pointer on the engine.

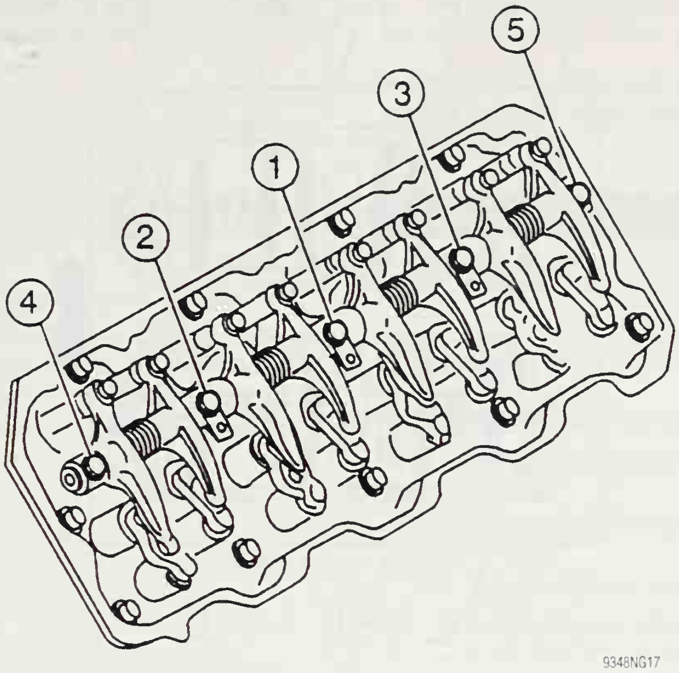
i. Loosen the valve clearance adjusting screws for the valves being adjusted.

j. Insert the feeler gauge between the tip of the rocker arm and the valve bridge.

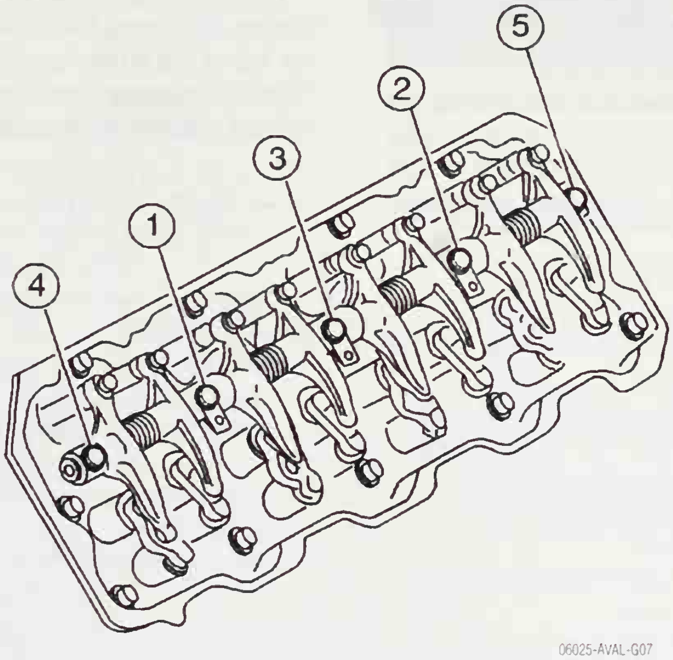
k. Adjust the intake and the exhaust valve clearance to 0.012 in. (0.3mm) with the engine cold. Refer to the figure for the valves that can be adjusted TDC of the exhaust stroke.

l. Tighten the valve adjusting screw lock nut to 16 ft. lbs. (22 Nm).

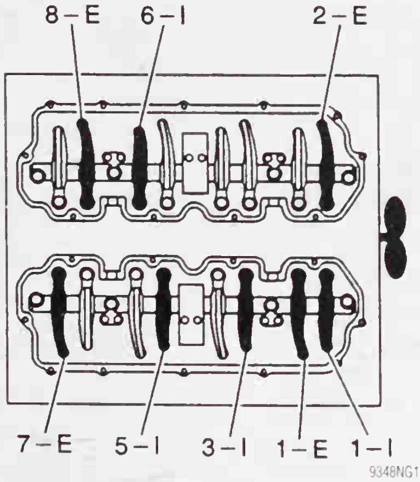
13. Install the upper and lower valve cover and fan clutch, as necessary.



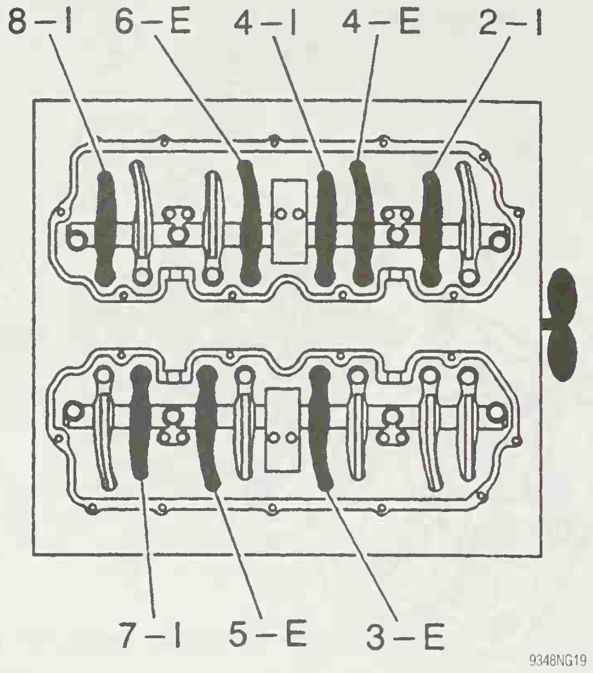
Rocker arm shaft tightening sequence—6.6L VIN 1 engines



Rocker arm shaft tightening sequence—6.6L VIN 2 engines



Location of the valves that are adjusted at TDC of the compression stroke—6.6L engine



Location of the valves that are adjusted at TDC of the exhaust stroke—6.6L engine

Turbocharger

REMOVAL & INSTALLATION

6.5L Engine

1. Remove or disconnect the following:
    - Negative battery cable
    - Air inlet duct
    - Oil feed line from the top of the turbocharger
    - Crankcase Depression Regulator (CDR) valve vent bracket screw
    - CDR valve and vent tube
    - Air cleaner assembly
    - Heat shield
    - Right front tire assembly and the splash shield
    - Exhaust pipe-to-turbocharger exhaust outlet elbow V-band clamp
    - Oil drain tube-to-turbocharger center bearing bolts
    - Exhaust manifold-to-turbocharger nuts
    - Turbocharger

To install:

➡Use anti-seize compound on all threaded fasteners connected to the turbocharger

2. Install or connect the following:
    - Turbocharger to the exhaust manifold. Torque the nuts to 37 ft. lbs. (50 Nm).
    - New oil drain tube flange gasket and the oil drain tube. Torque the bolts to 19 ft. lbs. (26 Nm).

➡Use 0.03–0.07 fl. oz. (0.88–2ml) of engine oil to feed the oil feed hole at the top of the turbocharger and hand rotate the compressor wheel/shaft. This will prelube the shaft bearings

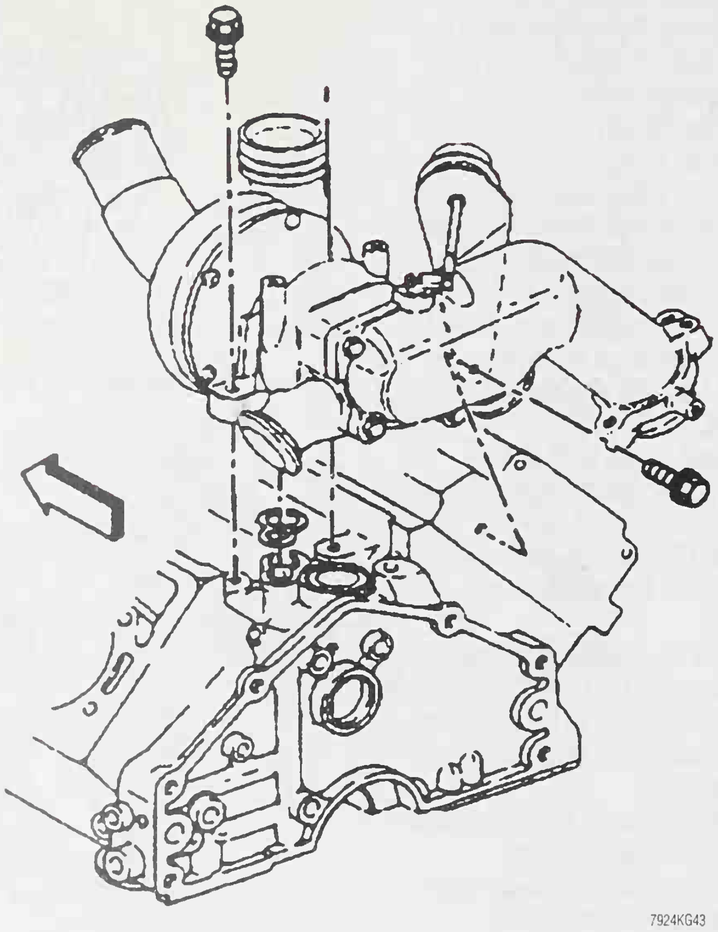
- Oil feed line. Torque the connection to 13 ft. lbs. (17 Nm).
- Exhaust pipe to the turbocharger exhaust elbow V-band clamp. Torque the clamp to 71 inch. lbs. (8 Nm).

3. Disengage the injection pump fuel shutdown solenoid connector and crank the engine for no more 15 seconds to prime the oil system. Do not let the engine start.
    - Right front wheel and splash shield
    - Heat shield. Apply Loctite® to the bolts and torque to 56 inch lbs. (6 Nm)
    - Air cleaner assembly
    - Turbocharger compressor outlet
    - CDR valve, tube and bracket
    - Air intake duct

➡Operate the engine at idle for at least 3 minutes after installing the turbocharger

6.6L Engine

1. Disconnect the negative battery cables.
2. Open the hood and move the hinge bolts to the service position.
3. Raise the vehicle.
4. Drain the coolant.
5. Remove or disconnect the following:
    - Left and right wheelhouse liners
    - Exhaust pipe-to-exhaust outlet



Turbocharger mounting—6.5L diesel engine

clamp. Move the clamp onto the exhaust pipe

- Transmission fluid fill tube-to-bell housing nuts if equipped with an A/T. Position the tube to the right side of the vehicle; it does not need to be removed from the transmission
- 3 nuts and left exhaust heat shield from the front of the lower dash panel
- Left exhaust pipe heat shield bolts

6. Position the left exhaust pipe heat shield to access the left exhaust pipe-to-manifold bolts. Do not remove the heat shield from the vehicle at this time.

➡**Do not bend the exhaust pipe at the expansion area.**

- Left, then the right exhaust pipe-to-exhaust manifold bolts
- Gaskets and discard
- Lower bolt for the exhaust outlet shield

7. Lower the vehicle.

- Upper intake manifold sight shield front retaining bolt
- Sight shield
- Air cleaner outlet duct from the air cleaner and turbocharger. Cover the openings to prevent debris from entering
- Charged air cooler outlet duct-to-intake hose clamps (loosen only)
- Hose from the charged air cooler duct-to-intake manifold tube
- A/C compressor clutch electrical connector
- A/C cut-out switch connector
- Drive belt
- A/C compressor mounting bolts; position the compressor aside with the lines attached
- Turbocharger inlet coolant hose from the bypass valve
- Turbocharger outlet coolant hose from the turbocharger
- Crankcase hose from the left valve cover and position aside
- Wire connector from the intake heater
- Intake air heater relay, if equipped
- Heat shield-to-turbocharger bolts and heat shield
- Remaining 2 bolts from the exhaust outlet heat shield
- Exhaust outlet heat shield
- 4 bolts and 2 nuts from the exhaust outlet. You do not have to remove the outlet for turbocharger removal

8. Move the exhaust outlet to one side in order to access the right exhaust pipe-to-turbocharger bolts.

- Exhaust outlet gasket and discard
- Right exhaust pipe-to-turbocharger bolts
- Right exhaust pipe and gasket

9. Move the exhaust outlet to one side for access to the left pipe.

- Left exhaust pipe heat shield
- Left exhaust pipe-to-turbocharger bolts
- Left exhaust pipe and gasket
- Turbocharger oil supply hose eye bolt and washers. Move the hose aside
- Turbocharger oil drain pipe nuts from the flywheel housing
- Turbocharger mounting bolts
- Turbocharger with the oil drain pipe

10. If replacing the turbocharger, remove the oil drain pipe and coolant hose.

To install:

11. Thoroughly clean the gasket surfaces.

12. Install or connect the following:

- Turbocharger oil drain pipe and new gasket. Tighten the bolts to 16 ft. lbs. (21 Nm).
- Turbocharger inlet coolant hose
- Turbocharger oil supply hose to the engine block
- Turbocharger oil supply hose eye bolt and washers and tighten to 31 ft. lbs. (42 Nm)
- Turbocharger lower heat shield
- Turbocharger. Tighten the 3 mounting bolts to 80 ft. lbs. (108 Nm).
- New gasket for oil drain pipe
- Oil drain pipe nuts and tighten to 15 ft. lbs. (20 Nm)

13. If installing a new turbocharger, pour 4–5 oz. of clean engine oil into the turbocharger supply hose opening, while rotating the impeller.

- Oil supply hose, using new washers. Tighten the eye bolt to 31 ft. lbs. (42 Nm).

14. Install the remaining components in the reverse order of removal, noting the following important points:

- When installing the exhaust pipe, use new gaskets and align the tabs and make sure the proper pipe flange is towards the turbocharger, as they are different. Tighten the exhaust pipe-to-turbocharger bolts to 39 ft. lbs. (53 Nm).
- Tighten the turbocharger heat shield bolts to 80 inch lbs. (9 Nm)
- Tighten the A/C compressor bolts to 37 ft. lbs. (50 Nm)
- Tighten the exhaust pipe clamp to 30 ft. lbs. (40 Nm)

15. Fill the cooling system and connect the negative battery cables.

➡**Operate the engine at idle for at least 3 minutes after installing the turbocharger**

Intake Manifold

REMOVAL & INSTALLATION

6.5L Engine

1. Recover the air conditioning refrigerant and reposition air conditioning lines.

2. Remove or disconnect the following:

- Negative battery cable
- Air cleaner assembly
- Fuel lines, and electrical connections
- Engine and transmission oil level tubes

✱✱ WARNING

Do not remove the center intake and side intakes as an assembly. Damage to the center intake and turbocharger may occur.

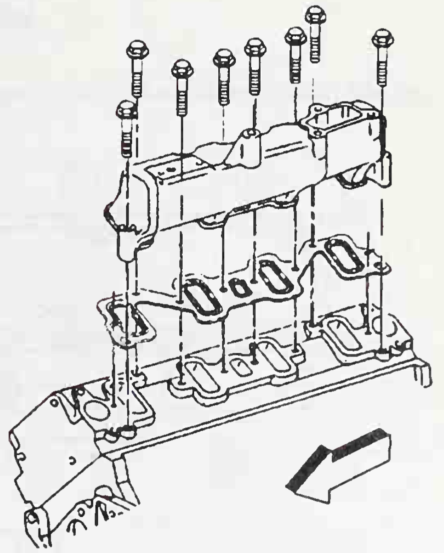
- Center intake assembly, and glow plug relay
- Side intake bolts and fuel retaining clips
- Side intakes

3. Clean all gasket surfaces.

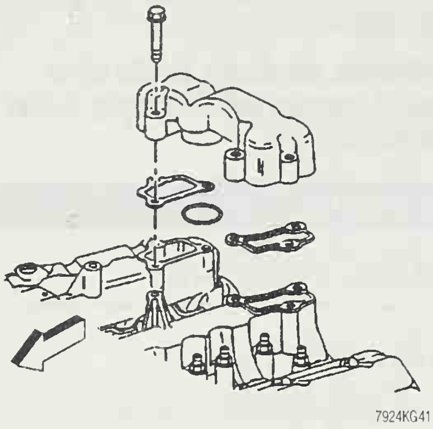
To install:

4. Install or connect the following:

- Side intakes and new gaskets.



Exploded view of the side intake manifold mounting—6.5L engines



Center intake manifold mounting—6.5L engines

  Torque the bolts to 31 ft. lbs. (42 Nm).
- Fuel lines retaining clips and electrical connection
- Center intake with new gaskets. Torque the bolts to 17 ft. lbs. (23 Nm).
- Engine oil and transmission oil level tubes
- Glow plug relay
- Air conditioning lines
- Air cleaner assembly
- Negative battery cable

5. Recharge air conditioning system.

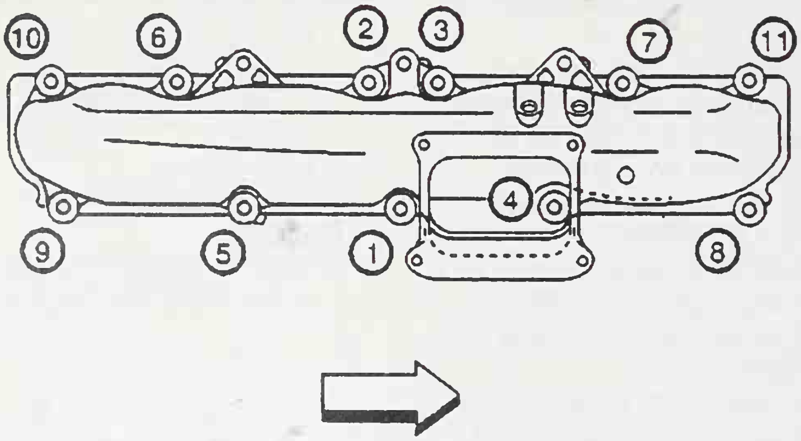
6.6L Engines

CENTER MANIFOLD

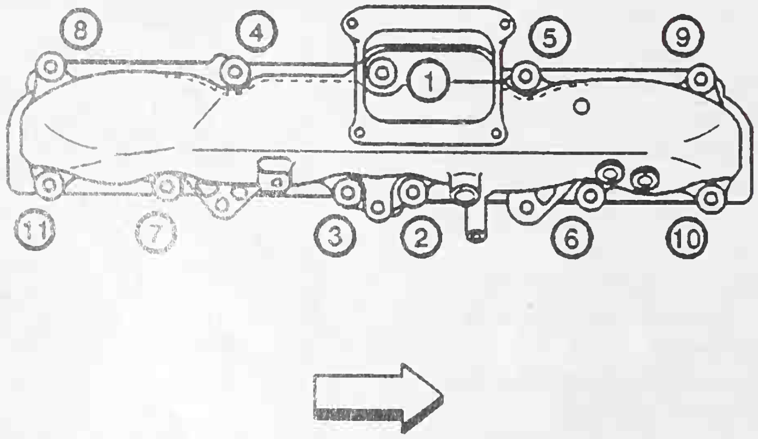
1. Remove the Exhaust Gas Recirculation (EGR) valve cooler tube.
2. Remove the intake manifold tube.
3. Remove and discard the 2 intake manifold tube gaskets.
4. Remove the turbocharger.
5. Remove the center intake manifold bolts/nuts.
6. Pull-up the center intake manifold in order to remove.
7. Remove and discard the gaskets.
8. Clean the center intake manifold in cleaning solvent and air dry.

To install:

9. Install new center intake manifold gaskets.
10. Install the center intake manifold.
11. Install the center intake manifold bolts/nuts and tighten to 89 inch lbs. (10 Nm).
12. Install the turbocharger.
13. Install 2 new O-rings onto the intake manifold tube.
14. Lubricate the O-rings with clean engine oil to aid in the installation.
15. Install the intake manifold tube.
16. Install the EGR valve cooler tube.



Left side intake manifold bolt tightening sequence—6.6L engine



Right side intake manifold bolt tightening sequence—6.6L engine

LEFT AND RIGHT MANIFOLDS

1. Drain the cooling system.
2. Remove or disconnect the following:
   - Batteries cables
   - Center intake manifold
   - Fuel junction block
   - Left or right fuel rail
   - Intake manifold tube
   - 9 bolts and 2 nuts from the intake manifold. A bolt is located in the manifold opening.

➡The intake manifold uses sealer. If necessary, pry at the area by the common rail bolt holes and be careful to avoid damaging the sealing surfaces.

   - Intake manifold from the head. Cover the head openings to prevent debris from entering.
3. Clean all gaskets surface.

To install:

4. Install or connect the following:
   - A ⅛ in. (2–3mm) wide to 1/16 in (0.5–1.5mm) high bead of sealant to the sealing surface of the intake manifold

➡The left and right side manifolds are NOT interchangeable.

   - Intake manifold
   - Bolts and nuts. Tighten to 15 ft. lbs. (20 Nm), in sequence.
   - Intake manifold tube
   - Fuel rail
   - Fuel junction block
   - Turbocharger
   - Negative battery cables
5. Fill cooling system.

Exhaust Manifold

REMOVAL & INSTALLATION

6.5L Engine

1. Remove or disconnect the following:
   - Batteries cables
   - Exhaust pipe from the manifold flange
   - Engine oil and transmission oil fill tubes
   - Engine cover and disconnect the glow plug wires
   - Glow plugs
   - Turbocharger assembly, as required
   - Air conditioner compressor rear bracket, as required

- Manifold bolts and the manifold

To install:

2. Install or connect the following:
   - Exhaust manifold. Torque the bolts to 26 ft. lbs. (35 Nm).
   - Exhaust pipe
   - Glow plugs and electrical connection
   - Engine and transmission oil fill tubes
   - Air conditioning compressor bracket
   - Negative battery cable

6.6L Engine

LEFT SIDE

1. Raise the vehicle.
2. Remove or disconnect the following:
   - Bolts securing the left exhaust pipe heat shield and move the heat shield aside
   - Left exhaust pipe-to-manifold bolts
   - Left front wheel
   - Left front fender splash shield
   - Charge air cooler duct
   - Exhaust manifold heat shield bolts and shield
   - 2 nuts and 6 bolts with the plain washer and bell view washer from the left manifold
   - Exhaust manifold by removing it from the rear, then the front studs and sliding it out the bottom, past the oil filter
   - Exhaust manifold gasket and discard

To install:

3. Installation is the reverse of the removal procedure. Tighten the retainers as follows:

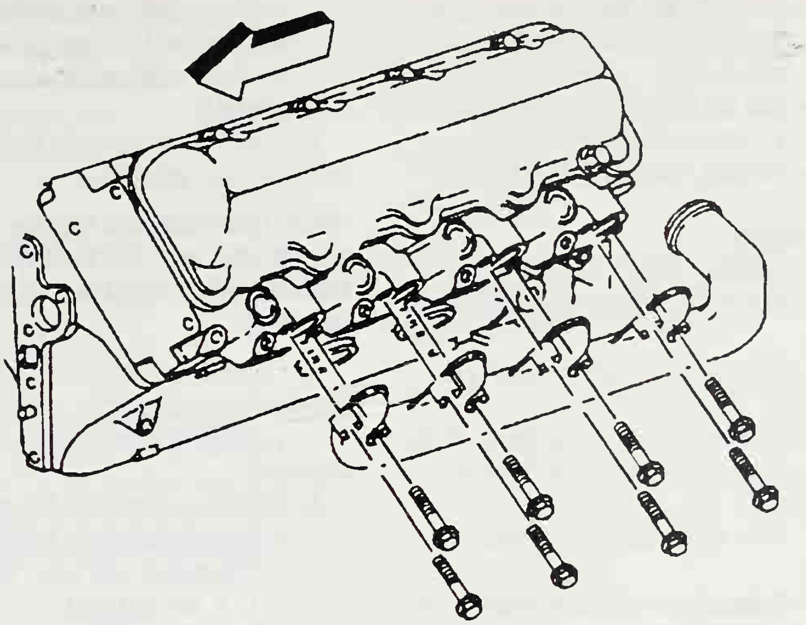
   a. Exhaust manifold nuts and bolts, in sequence, in 2 passes to 25 ft. lbs. (34 Nm).

   b. Heat shield bolts: 71 inch lbs. (8 Nm).

   c. Exhaust pipe-to-manifold bolts: 39 ft. lbs. (59 Nm).

RIGHT SIDE

1. Raise the vehicle.
2. Remove or disconnect the following:
   - Right front wheel
   - Right front fender splash shield
   - Exhaust manifold heat shield bolts and shield
   - Right exhaust pipe-to-manifold bolts
   - 2 nuts and 6 bolts with the plain washer and bell view washer from the left manifold
   - Exhaust manifold by removing it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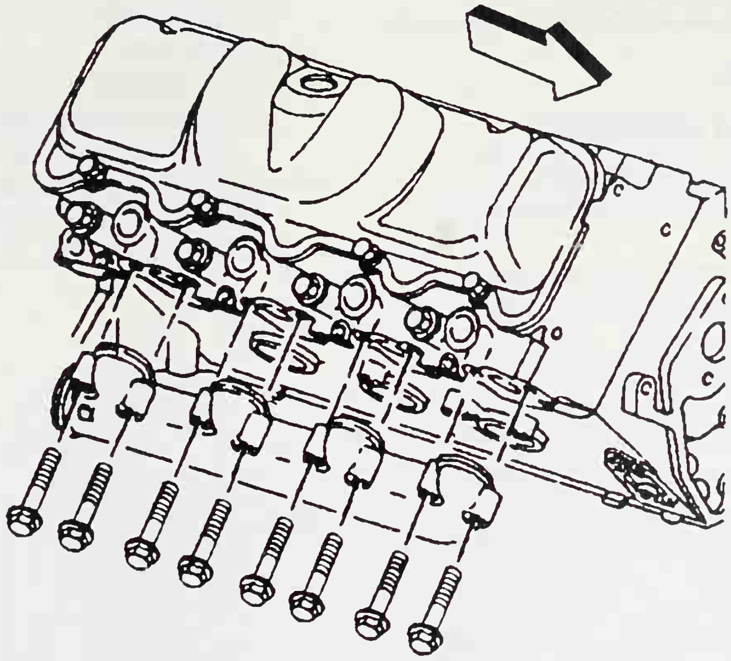
Exploded view of the left exhaust manifold mounting—6.5L diesel engines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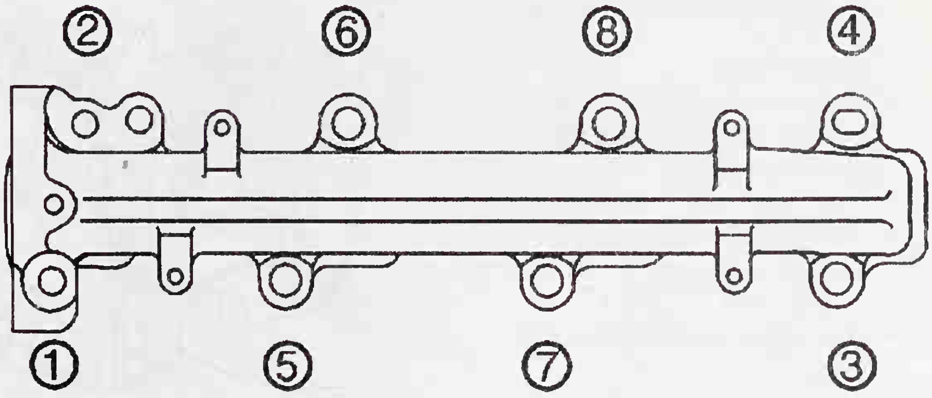
Exploded view of the right exhaust manifold mounting—6.5L diesel engines



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Left and right side exhaust manifold bolt removal and installation sequence—6.6L engine

from the rear, then the front studs and sliding it out the bottom, past the oil filter
- Bolt for the oil level dipstick tube, to remove the gasket
- Exhaust manifold gasket and discard

To install:

3. Installation is the reverse of the removal procedure. Tighten the retainers as follows:

a. Oil level dipstick tube: 15 ft. lbs. (20 Nm).

b. Exhaust manifold nuts and bolts, in sequence, in 2 passes: 25 ft. lbs. (34 Nm).

c. Heat shield bolts: 71 inch lbs. (8 Nm).

d. Exhaust pipe-to-manifold bolts: 39 ft. lbs. (59 Nm).

Camshaft and Valve Lifters

REMOVAL & INSTALLATION

6.5L Engine

SILVERADO AND SIERRA

1. Drain the cooling system.
2. Discharge the air conditioning system.
3. Relieve the fuel system pressure.
4. Remove or disconnect the following:
   - Battery cables
   - Radiator, condenser, shroud and fan assembly
   - Grille and parking light assembly
   - Hood latch and brace assembly
   - Oil pump drive
   - Power steering pump and position aside
   - Alternator
   - Air conditioner compressor and position aside
   - Rocker arm covers
   - Rocker arm assemblies and pushrods. Mark them so they can be returned to their original position.
   - Cylinder heads
   - Hydraulic lifters; keep them in order so they can be returned to their original bore
   - Front cover
   - Timing chain and camshaft sprocket
   - Injector pump
   - Front engine mounting through-bolts
   - Air conditioner condenser mounting bolts and tie the condenser out
   - Thrust plate bolts and thrust plate
   - Camshaft from the block
   - Thrust plate spacer, if necessary

To install:

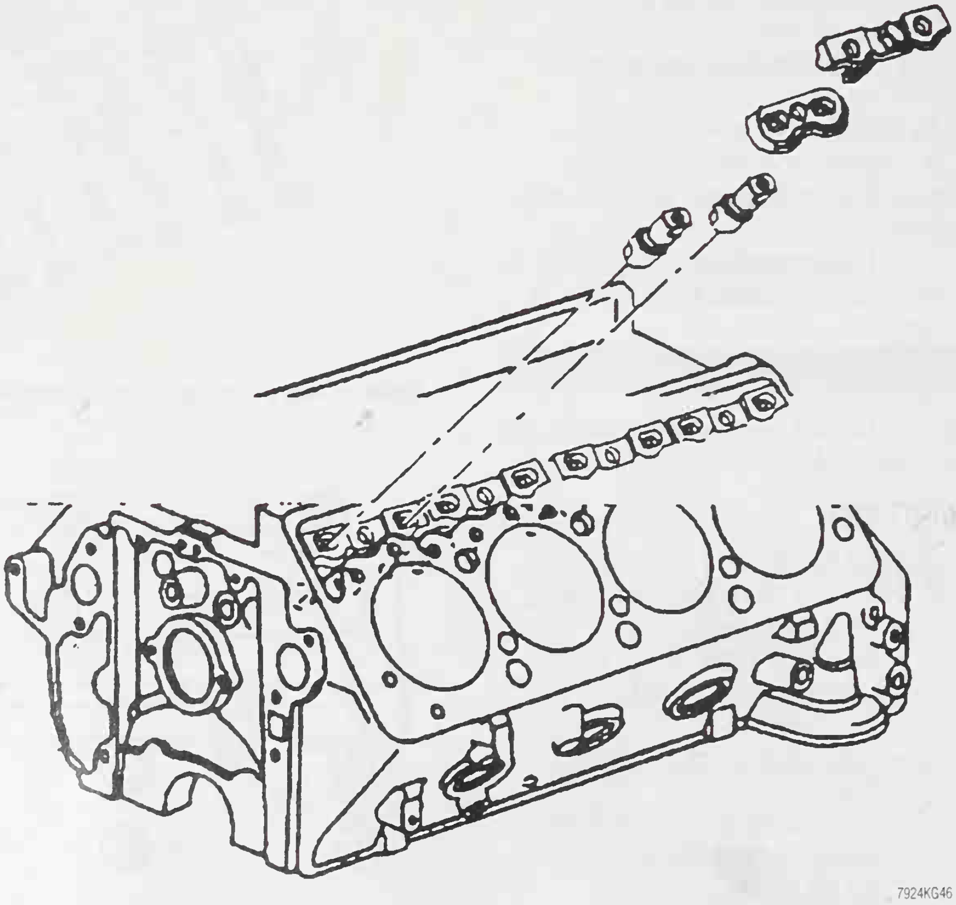
5. Install the spacer with the I.D. chamfer toward the camshaft.

➡It is recommended that the engine oil, oil filter and hydraulic lifters be replaced when installing a new camshaft.

6. Coat the camshaft lobes with Molykote® or equivalent.
7. Lubricate the camshaft journals with engine oil.
8. Install or connect the following:
   - Camshaft carefully into the block
   - Thrust plate and bolts. Tighten to 17 ft. lbs. (23 Nm).
   - Engine mount through-bolts
   - Timing chain and sprockets, align the timing marks
   - Air conditioner condenser, if equipped
   - Injector pump
   - Front cover
   - Cylinder head
   - Hydraulic lifters in the same bore as they were removed
   - Rocker arm assemblies and pushrods in their original locations
   - Rocker arm covers
   - Power steering pump, alternator and air conditioner compressor
   - Oil pump drive
   - Hood latch and brace
   - Grille and parking light assembly
   - Radiator, the shroud and fan assembly
   - Negative battery cables
9. Refill the cooling system with the proper type and quantity of antifreeze.

EXPRESS AND SAVANA

1. Drain the cooling system.
2. Relieve the fuel system pressure.
3. Remove or disconnect the following:
   - Battery cables
   - Headlight bezels
   - Grille, bumper and lower valance panel
   - Hood latch
   - Coolant recovery bottle
   - Upper tie bar
   - Air conditioner compressor
   - Radiator and fan
   - Oil pump drive
   - Cylinder heads to gain clearance for lifter removal
   - Alternator lower bracket
   - Water pump
   - Torsional damper
   - Front cover



Exploded view of the lifter, guide plate and clamp—6.5L diesel engines

- Injection pump
- Rocker arm covers
- Rocker arm assemblies and pushrods. Mark them so they can be returned to their original position.
- Hydraulic lifters and keep them in order so they can be returned to their original bore.
- Timing chain and camshaft sprocket
- Thrust plate bolts and thrust plate
- Camshaft from the block
- Thrust plate spacer, if necessary

To install:

4. Install the spacer with the I.D. chamfer toward the camshaft.

➡It is recommended that the engine oil, oil filter and hydraulic lifters be replaced when installing a new camshaft.

5. Coat the camshaft lobes with Molykote®, or equivalent.
6. Lubricate the camshaft journals with engine oil.
7. Install or connect the following:
   - Camshaft carefully into the block
   - Thrust plate and bolts. Torque the bolts to 17 ft. lbs. (23 Nm).
   - Timing chain and sprockets, align the timing marks
   - Hydraulic lifters in the same bore as they were removed
   - Rocker arm assemblies and pushrods in their original locations
   - Rocker arm covers
   - Fuel pump
   - Front cover
   - Torsional damper and water pump
   - Alternator lower bracket
   - Cylinder heads
   - Oil pump drive
   - Radiator and fan
   - Air conditioner compressor
   - Upper tie bar
   - Coolant recovery bottle
   - Hood latch
   - Grille, bumper and lower valence panel
   - Headlight bezels
   - Battery cables
8. Refill the cooling system.
9. Evacuate and charge the air conditioner system.

6.6L Engines

➡This procedure requires the use of the following special tools: Flywheel Holding Tool No. J 44643, Magnetic Base J 26900-13 and Dial Indicator J 26900-12.

1. Properly discharge the A/C system.
2. Remove or disconnect the following:
   - Both cylinder heads
   - Valve lifter guide hold-down bracket bolts
   - Valve lifter guide hold-down brackets
   - Valve lifter guides
   - Valve lifters
   - Charged air cooler
   - A/C condenser
   - Starter
3. Install the Flywheel Holding Tool No. J 44643 in the starter opening. Make sure the tool is flush to the flywheel opening. The holding tool will be used to remove the crankshaft balancer bolt and camshaft drive gear bolt.
   - Engine front cover
   - Oil pump driven gear nut and gear

➡The crankshaft reluctor and oil pump drive gear are timed together at the factory. Do NOT remove the reluctor from the oil pump drive gear.

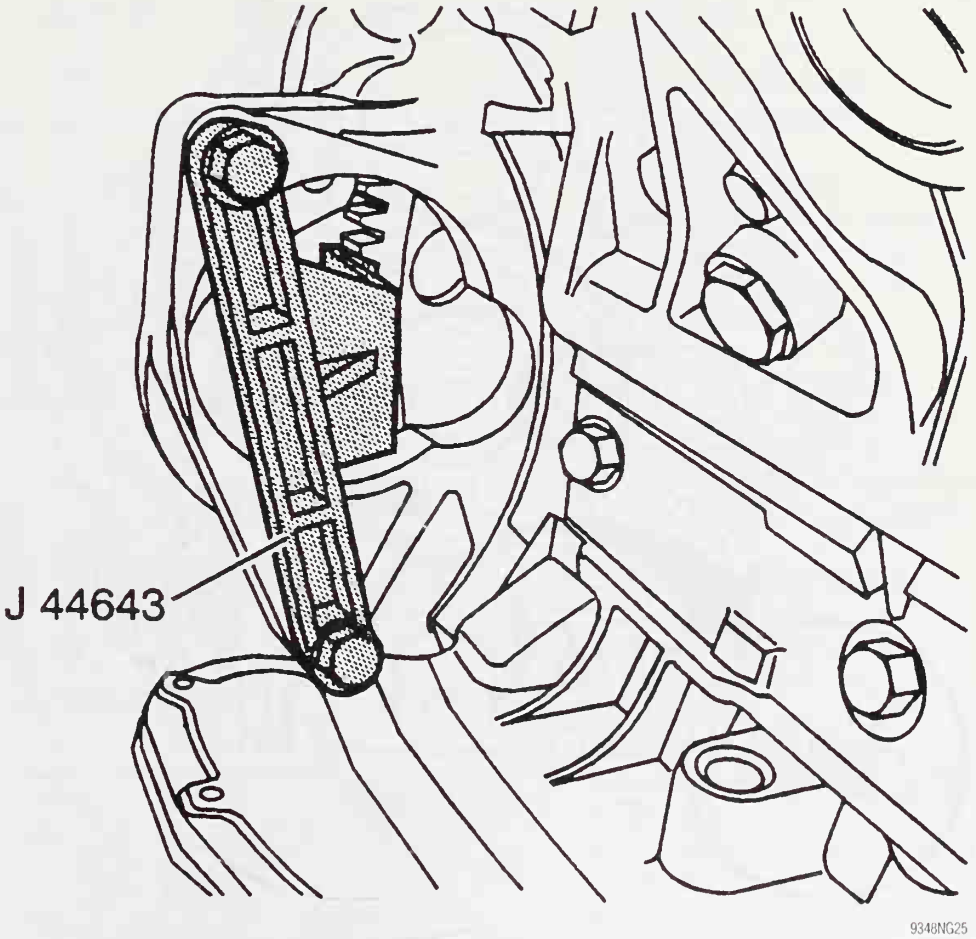
   - Oil pump drive gear and crankshaft reluctor assembly. Do not remove the reluctor bolts or damage the reluctor teeth
4. Using the Magnetic Base J 26900-13 and Dial Indicator J 26900-12, measure the camshaft end-play. The production value is 0.002–0.0045 in. (0.050-0.114mm) and the service limit is 0.008 in. (0.20mm). Replace the cam gear or thrust plate if the measured value exceeds the service limit.
   - Camshaft reluctor screws and reluctor

➡Use the flywheel holding tool to hold the engine from turning while loosening the camshaft gear bolt.

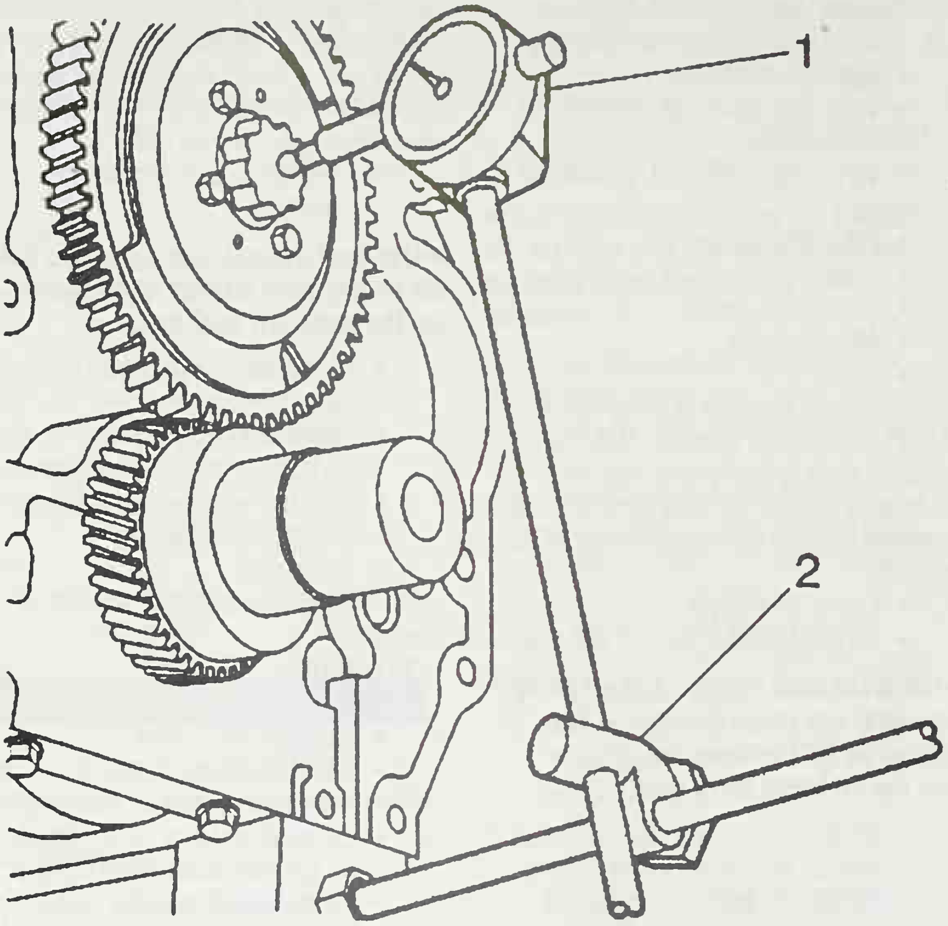
   - Loosen the camshaft gear bolt and leave the bolt finger-tight
   - Camshaft thrust plate bolts through the holes in the camshaft gear
   - Camshaft with the gear attached
   - Cam gear bolt and gear
   - Thrust plate
5. Clean and inspect the camshaft and bearings.

To install:

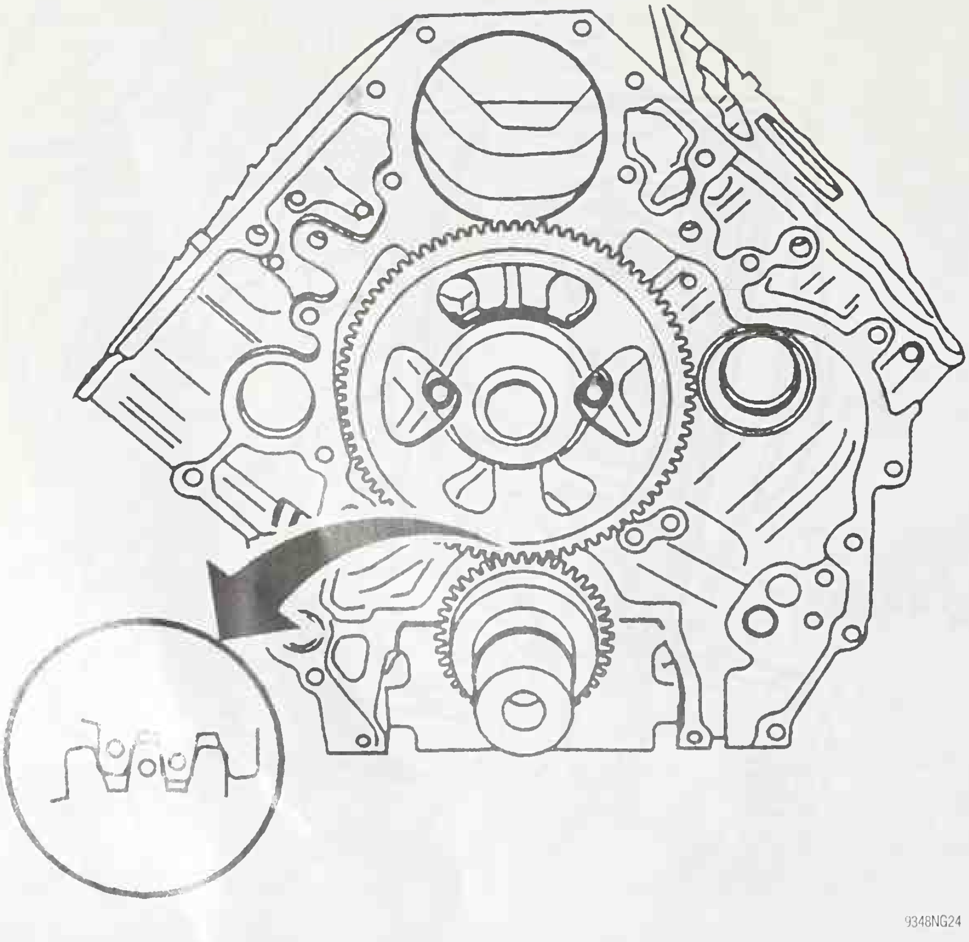
6. Install or connect the following:
   - Camshaft thrust plate
   - Camshaft driven gear
   - New driven gear bolt (finger-tight)
   - Camshaft and gear assembly into the cylinder block. Align the gear to the crankshaft gear
   - Threadlock to the thrust plate bolts
   - Thrust plate bolts and tighten to 19 ft. lbs. (26 Nm)



Proper installation of the flywheel holding tool in the starter opening



Use the dial indicator (1) and magnetic base (2) to measure the camshaft end-play



Camshaft and crankshaft gear alignment—6.5L engine

- Camshaft reluctor to the cam gear
- Reluctor bolts. Tighten to 80 inch lbs. (9 Nm) in a crisscross pattern.
- If removed, reinstall the flywheel holding tool in the starter opening
- Camshaft gear bolt and tighten to 173 ft. lbs. (234 Nm)

7. Using the Magnetic Base J 26900-13 and Dial Indicator J 26900-12, measure the camshaft end-play. The production value is 0.002–0.0045 in. (0.050-0.114mm) and the service limit is 0.008 in. (0.20mm). Replace the cam gear or thrust plate if the measured value exceeds the service limit.

- Oil pump drive gear and reluctor to the crankshaft. Do not damage the teeth of the reluctor.
- Oil pump driven gear and nut. Tighten to 74 ft. lbs. (100 Nm).
- Engine front cover
- A/C condenser
- Charged air cooler

8. Apply clean engine oil to the roller and outside of the lifters.

- Valve lifters
- Valve lifter guides
- Valve lifter guide hold-down brackets. Make sure that both tabs of the bracket are in the holes of the valve lifter guides.
- Valve lifter guide hold-down bracket bolts. Tighten to 97 inch lbs. (11 Nm).

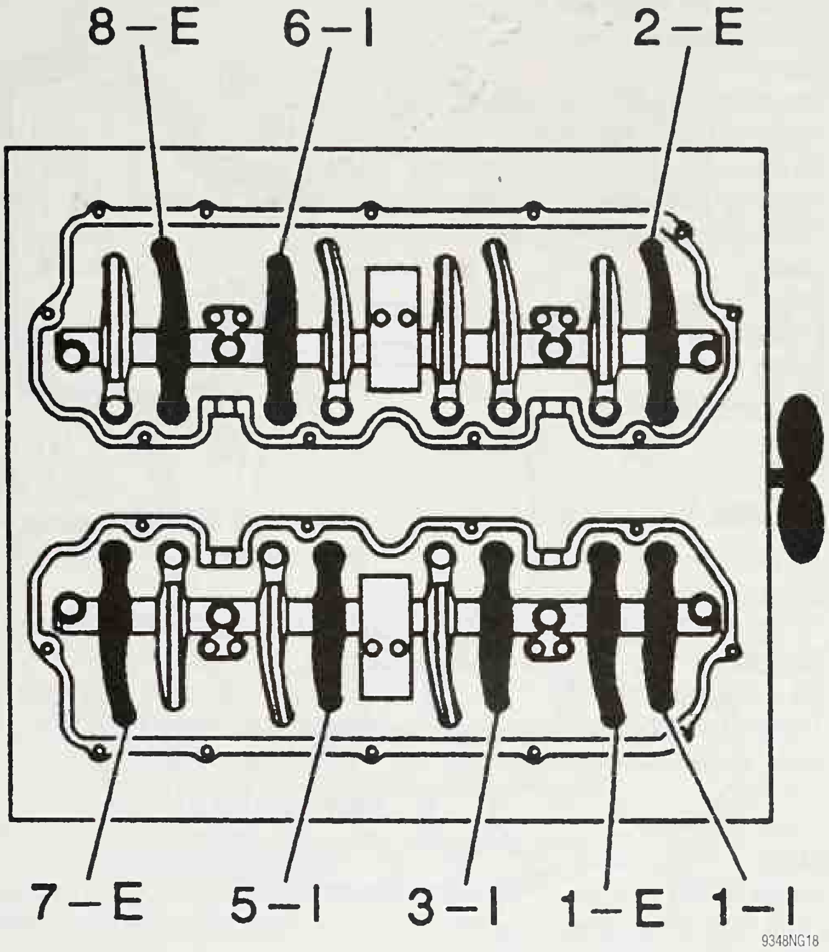
Valve Lash

ADJUSTMENT

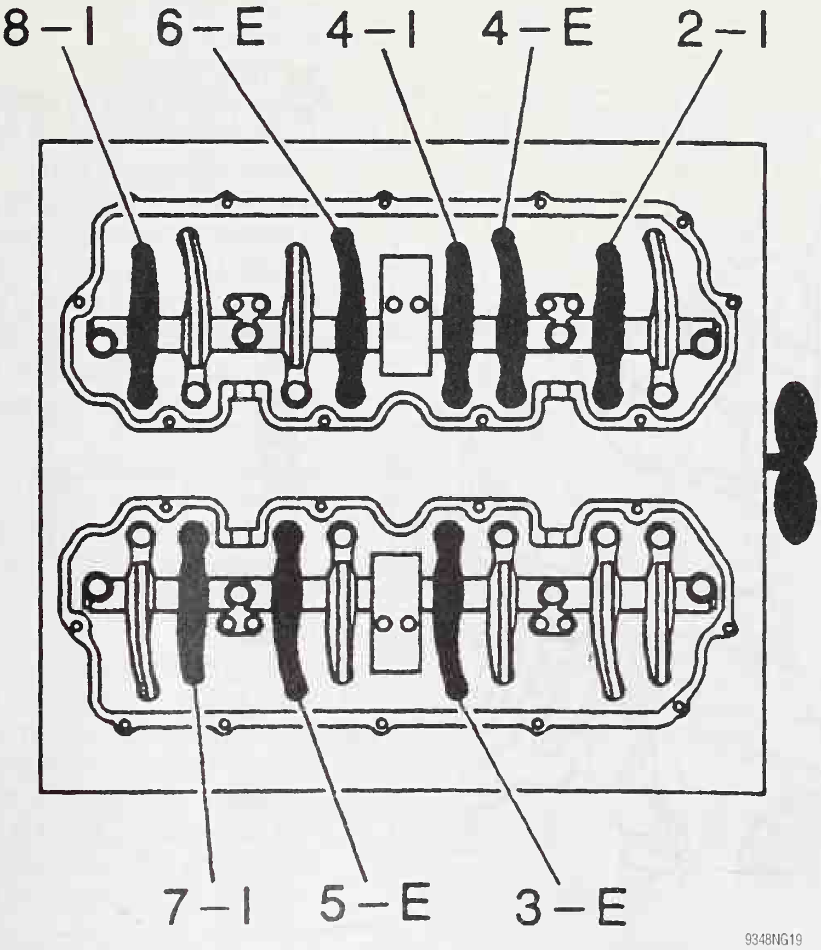
The 6.5L engine uses hydraulic lifters, which require no periodic adjustment.

6.6L Engine

1. Remove the fan clutch.
2. Remove both upper valve covers.
3. Rotate the engine in the normal direction and place the No. 1 piston at Top Dead Center (TDC) of the compression stroke. The No. 1 cylinder is at the right side front. While turning the engine, watch the intake valve to open and close. Align the mark on the crankshaft balancer with the pointer on the engine.
4. Loosen the valve clearance adjusting screws for the valve being adjusted.
5. Insert the feeler gauge between the tip of the rocker arm and the valve bridge.
6. Adjust the intake and the exhaust valve clearance to 0.012 in. (0.3mm) with the engine cold. Refer to the figure for the valves that can be adjusted TDC of the compression stroke.



Location of the valves that are adjusted at TDC of the compression stroke—6.6L engine



Location of the valves that are adjusted at TDC of the exhaust stroke—6.6L engine

7. Tighten the valve adjusting screw lock nut to 16 ft. lbs. (22 Nm).
8. Turn the engine one rotation in the normal direction and put the No. 1 piston at TDC of the exhaust stroke to adjust the remaining valve clearance. While turning the engine, watch the exhaust valve to open and close. Align the mark on the crankshaft balancer with the pointer on the engine.
9. Loosen the valve clearance adjusting screws for the valves being adjusted.
10. Insert the feeler gauge between the tip of the rocker arm and the valve bridge.
11. Adjust the intake and the exhaust valve clearance to 0.012 in. (0.3mm) with the engine cold. Refer to the figure for the valves that can be adjusted TDC of the exhaust stroke.
12. Tighten the valve adjusting screw lock nut to 16 ft. lbs. (22 Nm).
13. Install the upper and lower valve cover and fan clutch, as necessary.

Oil Pan

REMOVAL & INSTALLATION

6.5L Engine

SILVERADO AND SIERRA

1. Drain the engine oil.
2. Remove or disconnect the following:
    - Battery cables
    - Oil dipstick
    - Flywheel/flexplate cover
    - Oil cooler line guides
    - Front driveshaft
    - Front axle, if needed
    - Exhaust pipes from the manifolds
    - Front engine mount through-bolts
    - Oil pan bolts and the oil pan
    - Oil pan rear seal

To install:

3. Clean all sealing surfaces.
4. Apply a 3⁄16 in. (5mm) bead of RTV sealant to the oil pan sealing surface, inboard of the bolt holes. The sealant must be wet to the touch when the oil pan is to be installed.
5. Install or connect the following:
    - Oil pan rear seal
    - Oil pan to the engine. Torque all bolts except the rear 2 bolts to 84 inch lbs. (9.4 Nm). Tighten the rear bolts to 17 ft. lbs. (23 Nm).
    - Engine mounting through-bolt and nut
    - Front axles and front driveshaft, if removed
    - Oil cooler lines in guides
    - Oil dipstick

- Exhaust pipes to the manifolds
- Flywheel/flexplate cover
- Battery cables

6. Refill with the proper grade and quantity of oil.

EXPRESS AND SAVANA

1. Drain the engine oil.
2. Remove or disconnect the following:
   - Battery cables
   - Engine cover
   - Engine oil dipstick
   - Transmission flywheel/flexplate cover
   - Oil cooler lines at the block
   - Starter
   - Transmission cooler lines, battery cables and attaching clamps from the oil pan
   - Oil pan bolts
   - Oil pan and oil pan rear seal

To install:

3. Clean all sealing surfaces
4. Apply a 3⁄16 in. (5mm) bead of RTV sealant to the oil pan sealing surface, inboard of the bolt holes. The sealant must be wet to the touch when the oil pan is to be installed.
5. Install or connect the following:
   - Oil pan rear seal
   - Oil pan to the engine and the retaining bolts.
   - Starter
   - Transmission cooler lines, battery cables and attaching clamps to the oil pan
   - Engine oil cooler lines
   - Transmission flywheel/flexplate cover
   - Engine oil dipstick tube
   - Engine cover
   - Battery cables
6. Refill engine with oil.

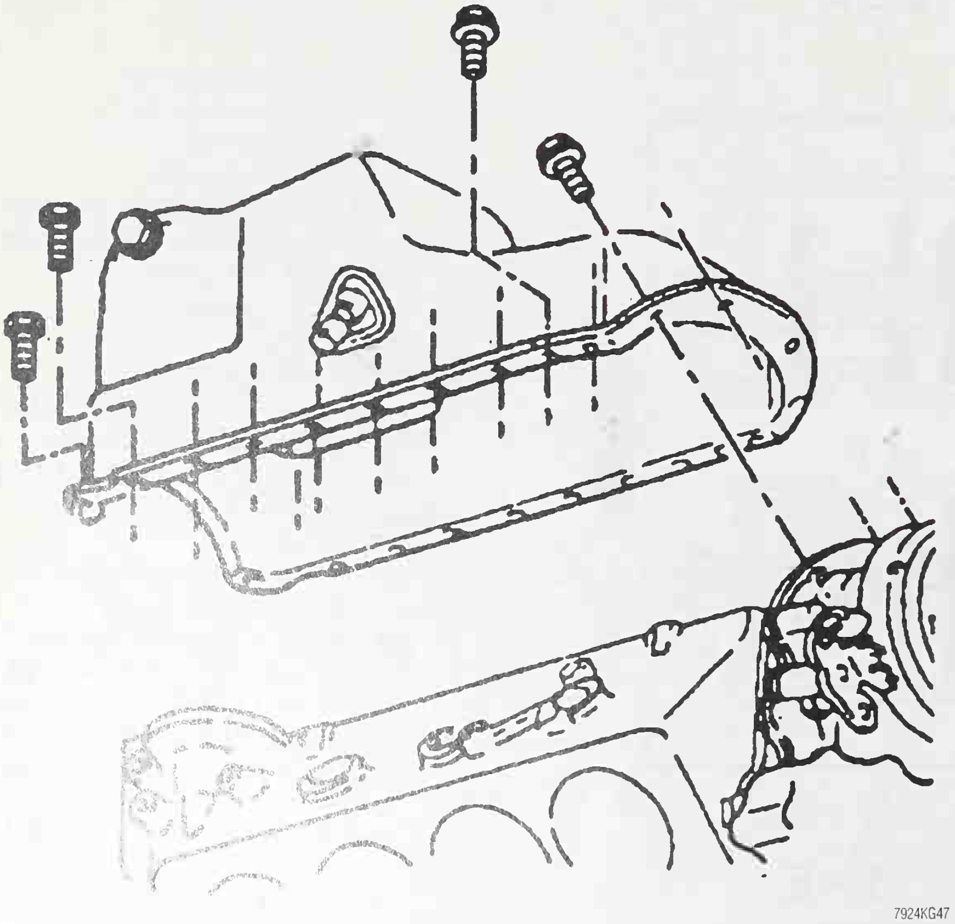
6.6L Engine

LOWER OIL PAN

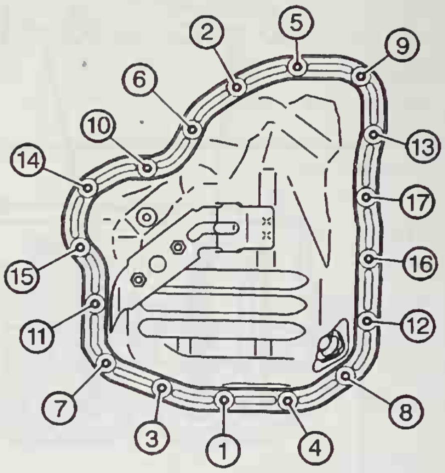
1. Drain the engine oil.
2. Remove or disconnect the following:
   - Oil pan skid plate (2WD vehicles)
   - Crossbar
   - Oil level sensor connector
   - Lower oil pan bolts and nuts
   - Lower oil pan from the lower crankcase
   - Lower oil pan

To install:

3. Clean all sealing surfaces
4. Apply a ⅛ in. (2mm) bead of sealant to the oil pan sealing surface.
5. Install the oil pan. Tighten the bolts and nuts in sequence to 89 inch lbs. (10 Nm)



Exploded view of the oil pan mounting—6.5L diesel engines



Lower oil pan tightening sequence—6.6L diesel engines

6. The remainder of installation is the reverse of the removal procedure.
7. Refill engine with oil.

UPPER OIL PAN

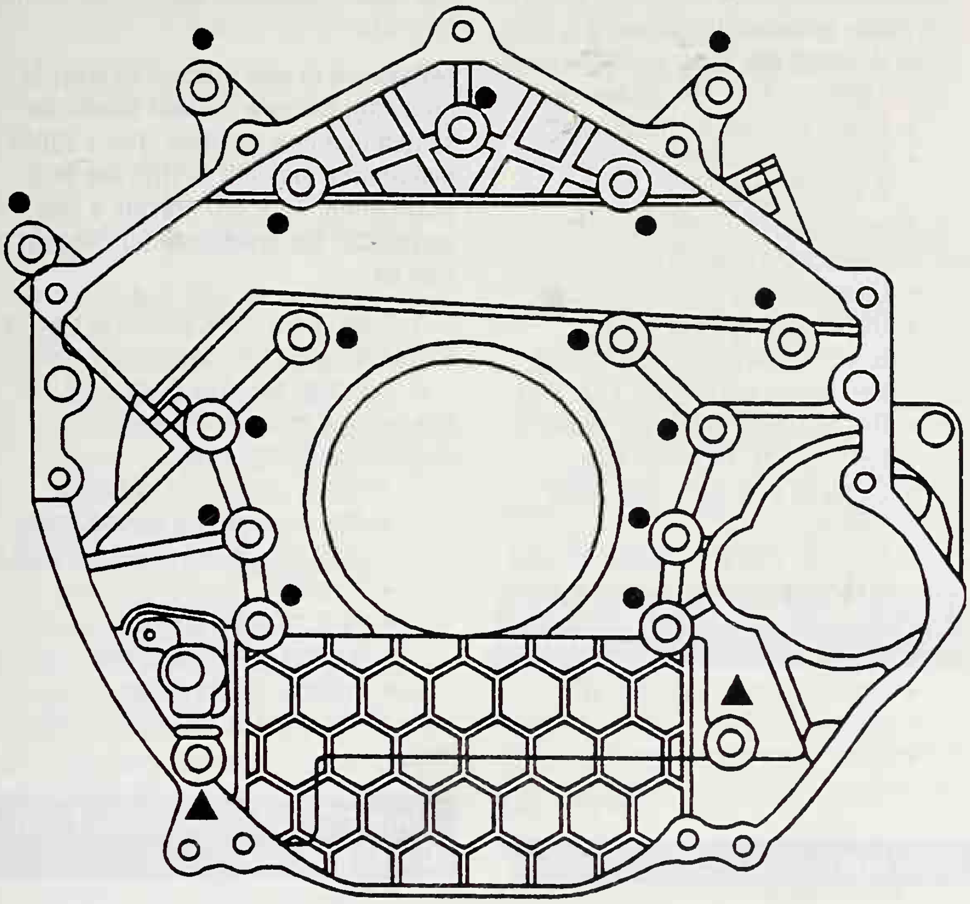
1. Drain the engine oil.
2. Remove or disconnect the following:
   - Front differential carrier (4WD vehicles)
   - Relay rod from the pitman arm and idler arm (2WD vehicles)
   - Transmission
   - Lower oil pan
   - Flywheel/flexplate
   - Positive and negative battery cable bracket bolts and bracket from the front of the upper oil pan
   - Positive and negative battery cable bracket nut and bracket from the right side of the upper oil pan
   - 2 engine flywheel housing to upper oil pan bolts (refer to denoted black triangles on accompanying figure)
   - Upper oil pan bolts and any brackets
   - Upper oil pan from the engine block
   - Upper oil pan. The oil dipstick tube needs to be removed while lowering the upper oil pan.

To install:

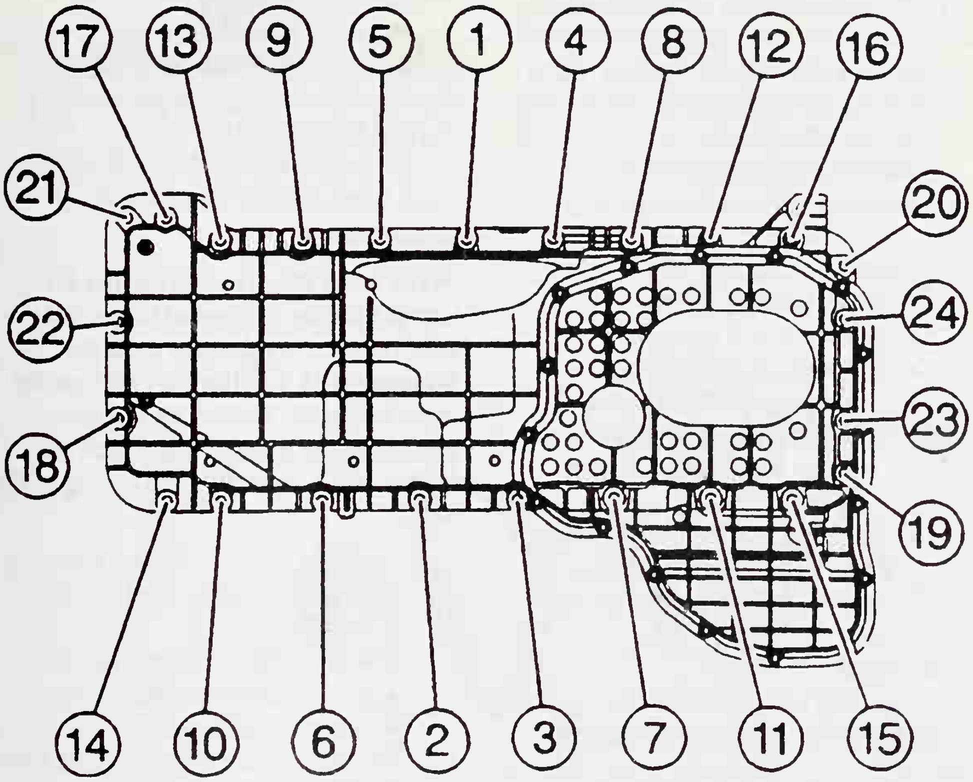
3. Clean all sealing surfaces
4. Apply a ⅛ in. (2mm) bead of sealant to the oil pan and flywheel sealing surfaces.
5. Install or connect the following:
   - Upper oil pan; make sure the dipstick is installed into the upper pan
   - Upper pan bolts and brackets. Tighten, in sequence, to 15 ft. lbs. (20 Nm).
   - 2 engine flywheel housing to upper

oil pan bolts (refer to denoted black triangles on accompanying figure). Torque to 37 ft. lbs. (50 Nm).

6. The remainder of installation is the reverse of the removal procedure.
7. Refill engine with oil.



Remove only the flywheel housing-to-upper oil pan bolts designated with a black triangle—6.6L engine



Upper oil pan bolt tightening sequence—6.6L engine

Oil Pump

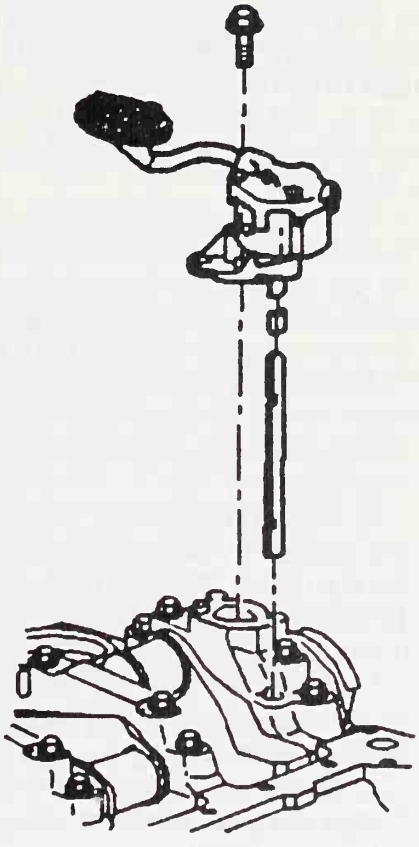
REMOVAL & INSTALLATION

6.5L Engine

1. Drain the engine oil
2. Remove or disconnect the following:
    - Oil pan
    - Oil pump to crankshaft rear main bearing attaching bolt
    - Oil pump and hex drive

To install:

3. Inspect the oil pan pick up tube and screen for damage and the hex drive for cracks.
4. Install or connect the following:
    - Oil pump and extension shaft to the engine. Align the extension shaft hex with the drive hex, the oil pump should push easily into place.
    - Oil pump bolt and tighten to 65 ft. lbs. (90 Nm)



Exploded view of the oil pump mounting—6.5L diesel engines

  - Oil pan
5. Refill the crankcase with oil.

6.6L Engine

1. Drain the engine oil
2. Remove or disconnect the following:
  - Engine flywheel housing (2WD vehicles)
  - Engine front cover
  - Lower and upper oil pans
  - Oil pump pipe and screen and gasket
3. Block the crankshaft from turning with a wooden dowel.
  - Oil pump driven gear nut
  - Oil pump driven gear

➡The crankshaft reluctor and oil pump drive gear are timed together at the factory. Do NOT remove the reluctor from the oil pump drive gear or damage the reluctor teeth.

  - Oil pump drive gear and crankshaft reluctor assembly using a brass drift and tapping as close to the center of the reluctor assembly
  - 3 hex head and 1 Allen head bolt
  - Oil pump
  - Oil pump O-ring seal
  - Oil pump gear cover bolts and cover
4. Measure the clearance between the gear teeth and oil pump housing using a feeler gauge. The production clearance is 0.0049–0.0087 in. (0.125–0.221mm) and the service limit is 0.0087 in. (0.221mm). Replace the pump if the clearance exceeds the service limit.
5. Use a feeler gauge and a straightedge to measure the clearance between the side of the gear and the cover. The production clearance is 0.0025–0.0043 in. (0.064–0.109mm) and the service limit is 0.0043 in. (0.109mm). Replace the pump if the clearance exceeds the service limit.
6. Calculate the driven gear shaft-to-bushing clearance:
  a. Measure the driven gear shaft outside diameter. The production specification is 0.7853–0.7858 in. (19.947–19.960mm) and the service limit is 0.7819 in. (19.86mm).
  b. Measure the driven gear bushing inside diameter. The production value is 0.7874 in. (20mm).
  c. Calculate the driven gear shaft-to-bushing clearance. The service limit is 0.0055 in. (0.14mm).
  d. Replace the pump if the clearance exceeds the service limit.

To install:

7. Install or connect the following:
  - Oil pump gear cover and bolts. Tighten to 15 ft. lbs. (20 Nm).
  - New O-ring seal for the oil pump
  - Oil pump and bolts. Tighten to 15 ft. lbs. (20 Nm).
8. Check the oil pump drive gear for wear and replace the gear pin if necessary.
  - Oil pump drive gear and reluctor
  - Oil pump driven gear and nut. Block the crankshaft from moving, then tighten to 74 ft. lbs. (100 Nm)
  - Oil pump pipe and screen gasket to the oil pump (4WD vehicle)
  - Oil pump pipe and screen (4WD vehicle)
  - Oil pump pipe and screen bolts and nuts (4WD vehicle). Tighten to 18 ft. lbs. (25 Nm).
  - Engine front cover
  - Engine flywheel housing (2WD vehicle)
  - Upper and lower oil pans
9. Refill the crankcase with oil.

Rear Main Seal

REMOVAL & INSTALLATION

Please note that the entire transmission assembly must be removed before performing this procedure. Before a new seal is installed, the Crankcase Depression Regulator (CDR) and crankcase ventilation system should be cleaned and inspected. In addition, use care removing the flywheel. Some models use a heavy, dual mass flywheel that must be handled with care.

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Remove or disconnect the following:
  - Negative battery cables
  - Transfer case, if equipped
  - Transmission assembly
  - Clutch assembly and flywheel, if equipped with manual transmission
  - Flexplate, if equipped with automatic transmission
  - Crankshaft rear main oil seal by inserting a suitable crankshaft seal removal tool and prying the seal out

To install:

3. Clean the oil seal bore in the block thoroughly before installation of the new seal.
4. Inspect the crankshaft for grit, rust or burrs and correct as necessary. Also inspect the portion of the crankshaft where the oil seal makes contact, for wear due to the rubbing action of the oil seal.

➡Because of rear crankshaft wear or grooving, the new oil seal should be seated in a new location. The J 39084 installation tool will control the seal positioning. This will provide a new surface on the crankshaft for the seal to ride on.

5. Clean the running surface of the crankshaft with a non-abrasive cleaner.
6. Lubricate the inner diameter of the new seal and the outer diameter of the crankshaft with engine oil.
7. Install or connect the following:
  - Rear main oil seal using a crankshaft rear oil seal installation tool
  - Flywheel.
  - Transmission assembly
  - Transfer case, if equipped
  - Negative battery cables
8. Start the engine and verify no oil leaks.

Timing Chain, Sprockets, Front Cover and Seal

REMOVAL & INSTALLATION

6.5L Engine

1. Drain the cooling system.
2. Remove or disconnect the following:
  - Negative battery cables
  - Water pump and pulleys
3. Rotate the crankshaft to align the marks on the torsional damper with the **0** mark on the timing tab.
4. Scribe a mark aligning the injection pump flange and the front cover, if not already marked.

➡The outer ring (weight) of the torsional damper is bonded to the hub with rubber. The damper must be removed with a puller that acts on the inner hub only. Pulling on the outer portion of the damper will break the rubber bond or destroy the tuning of the unit.

5. Remove or disconnect the following:
  - Crankshaft pulley and torsional damper
  - Front cover-to-oil pan bolts (4)
  - 2 fuel return line clips
  - Injection pump gear
  - Injection pump retaining nuts from the front cover
  - Crankshaft sensor
  - Baffle

- Cover bolts remaining and the front cover
- Injection pump gear

6. Align the camshaft timing gear marks

- Bolt and washer attaching the camshaft gear
- Camshaft sprocket with the timing chain
- Crankshaft sprocket.

To install:

7. Install or connect the following:

- Cam sprocket, timing chain and crankshaft sprocket as a unit, aligning the timing marks on the sprockets.

8. Rotate the crankshaft to align the injection pump and camshaft gears.

- Injection pump gear

9. If the front cover oil seal is to be replaced, it can now be pried out of the cover with a suitable prying tool. Press the new seal into the cover evenly.

10. Clean both sealing surfaces until all traces of old sealer are gone. Apply a 3/32 in. (2mm) bead of GM sealant 1052357 or equivalent to the sealing surface. Apply a 3/16 in. (5mm) bead of RTV type sealer to the bottom portion of the front cover which attaches to the oil pan.

- Front cover
- Baffle
- Injection pump. Torque the nuts to 31 ft. lbs. (42 Nm), making sure the scribe marks on the pump and front cover are aligned.
- Injection pump driven gear. Torque the injection pump gear bolts to 17 ft. lbs. (23 Nm), making sure the marks on the cam gear and pump are aligned.

➡Verify that there is a minimum clearance of 0.040 in. (1.0mm) between the injection pump gear and baffle or noise may be result.

- Fuel line clips
- Front cover-to-oil bolts
- Torsional damper
- Crankshaft pulley. Torque the bolts to 80 inch lbs. (9 Nm).
- Oil pan bolts. Torque the bolts to 106 inch lbs. (12 Nm).
- Water pump
- Pulley assembly
- Negative battery cables

11. Refill the cooling system with the proper type and quantity of antifreeze.

12. Inspect the engine for leaks.

Timing Gears, Front Cover and Seal

REMOVAL & INSTALLATION

6.6L Engine

➡The 6.6L engine uses gears in place of a timing chain. For removal and installation, please see the Camshaft and Lifters procedure. This procedure covers the removal of the front cover and seal.

1. Remove the upper intake manifold sight shield as follows:
   a. Remove the retaining bolt in the front of the shield.
   b. Lift up on the front of the shield, then lift the shield off the rear bracket.
2. Drain the cooling system.
3. Remove or disconnect the following:

- Negative battery cables
- Right front wheel
- Right front fender splash shield
- Upper fan shroud
- Fan clutch
- Drive belt
- Oil dipstick tube
- Thermostat housing crossover
- Crankshaft balancer
- Crankshaft front oil seal
- Water pump
- Camshaft sensor electrical connector
- Camshaft sensor bolt and sensor
- Crankshaft Position (CKP) sensor connector, bolt and sensor
- CKP sensor spacer bolts and spacer
- 5 bolts securing the upper oil pan to the front cover
- Bracket bolts and the bracket for the turbocharger outlet coolant pipe
- Engine front cover bolts
- Use a suitable seal cutter to separate the front cover from the cylinder block and upper oil pan

➡Do not bend the turbocharger outlet pipe.

- O-ring from the front cover
- Oil pressure relief valve from the front cover

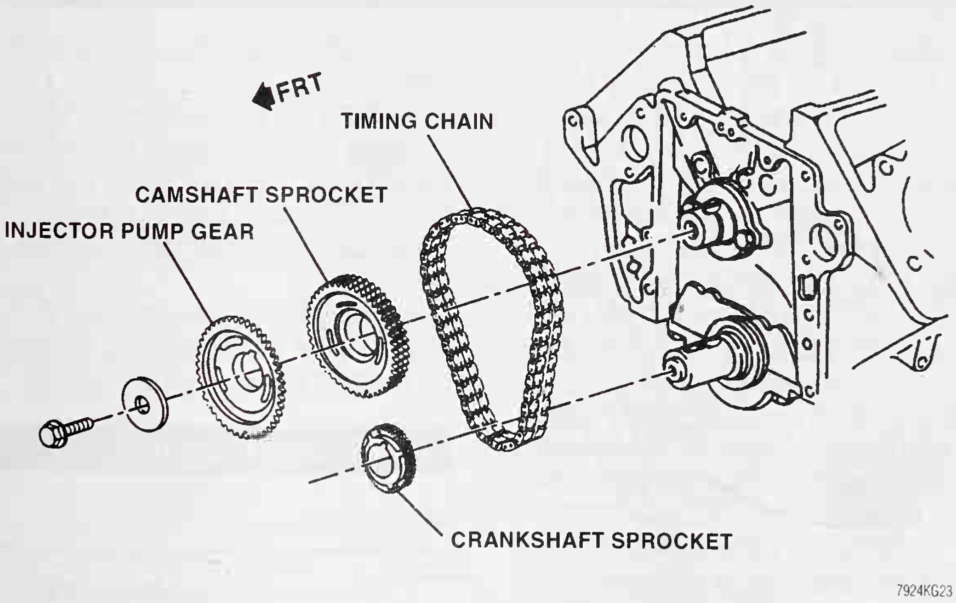
To install:

4. Clean and inspect all sealing surfaces.
5. Install or connect the following:

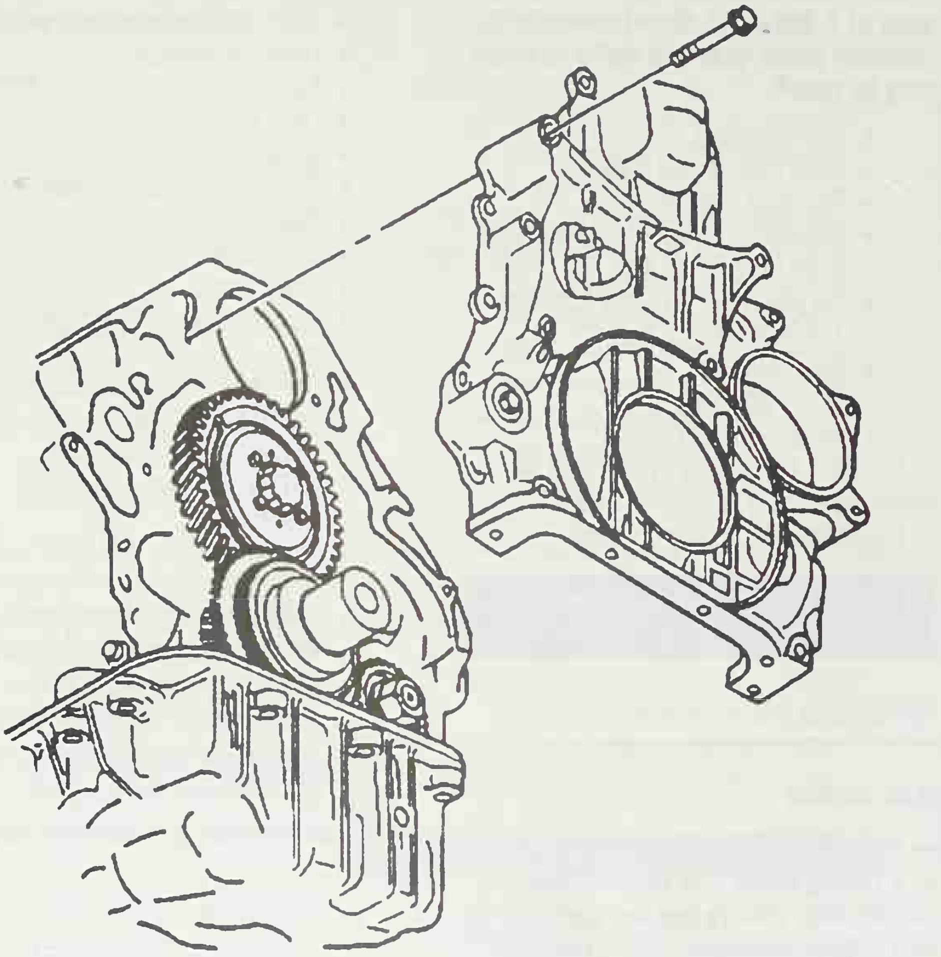
- Oil pressure relief valve with a new O-ring. Tighten to 30 ft. lbs. (41 Nm).
- Apply a 1/8 in. (2–3mm) wide to 1/16 in. (0.5–1.5mm) high bead of sealant to the front cover sealing surfaces to the engine block and oil pan.
- New front cover O-ring after lubricating it with engine oil
- Front cover and bolts. Tighten to 18 ft. lbs. (25 Nm).
- Upper oil pan-to-front cover bolts. Tighten to 15 ft. lbs. (20 Nm).
- Turbocharger coolant outlet pipe bracket and bolts. Tighten to 15 ft. lbs. (20 Nm).
- Camshaft sensor and bolt. Tighten to 80 inch lbs. (9 Nm).
- Camshaft sensor connector

➡The CKP sensor spacers are machined with different timing positions. If you have to replace a spacer, make sure it has the same part number.

- CKP sensor spacer and spacer bolts. Tighten to 89 inch lbs. (10 Nm).



Timing chain and related components—6.5L diesel engines



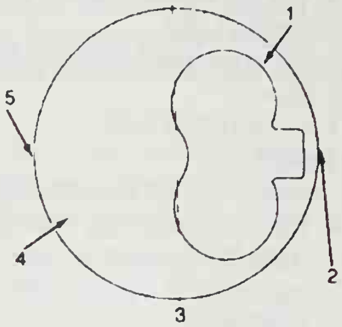
Engine front cover—6.6L engine

- CKP sensor and bolt. Tighten to 89 inch lbs. (10 Nm).
- Water pump
- Crankshaft front oil seal
- Crankshaft balancer
- Thermostat housing crossover
- Oil fill tube
- Drive belt
- Upper fan shroud
- Right front fender splash shield and wheel
- Negative battery cables

6. Refill the cooling system with the proper type and quantity of antifreeze.
7. Inspect the engine for leaks.

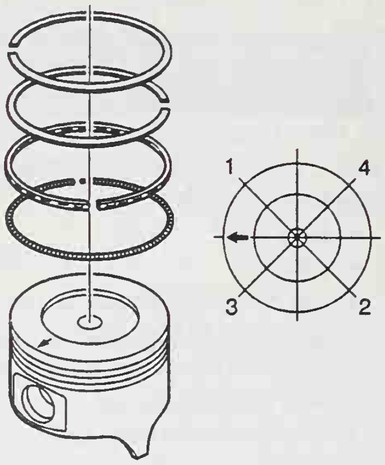
Piston and Ring

POSITIONING



1 Oil control ring expander gap
2 Second compression ring gap
3 Centerline of piston pin
4 Oil control ring gap
5. Top compression ring gap

Piston ring end-gap spacing —6.5L diesel engines



Piston ring positioning—6.6L diesel engines

GASOLINE FUEL SYSTEM

Fuel System Service Precautions

Safety is the most important factor when performing not only fuel system maintenance but any type of maintenance. Failure to conduct maintenance and repairs in a safe manner may result in serious personal injury or death. Maintenance and testing of the vehicle's fuel system components can be accomplished safely and effectively by adhering to the following rules and guidelines.

- To avoid the possibility of fire and personal injury, always disconnect the negative battery cable unless the repair or test procedure requires that battery voltage be applied.
- Always relieve the fuel system pressure prior to disconnecting any fuel system component (injector, fuel rail, pressure regulator, etc.), fitting or fuel line connection. Exercise extreme caution whenever relieving fuel system pressure, to avoid exposing skin, face and eyes to fuel spray. Please be advised that fuel under pressure may penetrate the skin or any part of the body that it contacts.
- Always place a shop towel or cloth around the fitting or connection prior to loosening to absorb any excess fuel due to spillage. Ensure that all fuel spillage (should it occur) is quickly removed from engine surfaces. Ensure that all fuel soaked cloths or towels are deposited into a suitable waste container.
- Always keep a dry chemical (Class B) fire extinguisher near the work area.
- Do not allow fuel spray or fuel vapors to come into contact with a spark or open flame.
- Always use a back-up wrench when loosening and tightening fuel line connection fittings. This will prevent unnecessary stress and torsion to fuel line piping. Always follow the proper torque specifications.
- Always replace worn fuel fitting O-rings with new. Do not substitute fuel hose or equivalent where fuel pipe is installed.

Fuel System Pressure

RELIEVING

A Schrader valve is provided on these fuel systems, in order to conveniently test or release the system pressure. A fuel pressure gauge and adapter will be necessary to connect the gauge to the fitting. Most of the MFI systems utilize a service valve on one end of the fuel rail assembly. The CMFI system covered here uses a valve located on the inlet pipe fitting, immediately before it enters the CMFI assembly (towards the rear of the engine)

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Turn the ignition **OFF**.
3. Disconnect the negative battery cable.
4. Loosen the fuel filler cap in order to relieve the fuel tank vapor pressure.
5. Connect a fuel pressure gauge to the fuel pressure valve/fitting.
6. Wrap a shop towel around the fitting while connecting the gauge in order to avoid spillage.
7. Install the bleed hose of the gauge into an approved container.
8. Open the valve on the gauge to bleed the system pressure.

The fuel connections are now safe for servicing. Drain any fuel remaining in the gauge into an approved container.

Fuel Filter

REMOVAL & INSTALLATION

➡On 2005-06 gasoline engines the fuel filter is integral with the fuel pump/sender assembly in the fuel tank.

2002–04 Sierra, Silverado & Avalanche

EXCEPT 2004 5.3L ENGINE

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Disconnect the negative battery cable.
3. Relieve the fuel system pressure.
4. Raise the vehicle.
5. Clean all the fuel filter connections and the surrounding areas before disconnecting the fuel pipes in order to avoid possible contamination of the fuel system.
6. Disconnect the threaded fittings from the fuel filter.
7. Cap the fuel pipes in order to prevent possible fuel system contamination.
8. Slide the fuel filter from the bracket located on the frame rail.
9. Inspect the fuel pipe O-rings for cuts, nicks, swelling, or distortion. Replace the O-rings if necessary.

To install:

10. Slide the fuel filter into the bracket. Remove the caps from the fuel pipes.
11. Connect the threaded fittings to the fuel filter. Tighten the fittings to 18 ft. lbs. (25 Nm).
12. Lower the vehicle.
13. Tighten the fuel filler cap.
14. Connect the negative battery cable.
15. Turn the ignition **ON** for 2 seconds.
16. Turn the ignition **OFF** for 10 seconds.
17. Turn the ignition **ON**.
18. Inspect for fuel leaks.

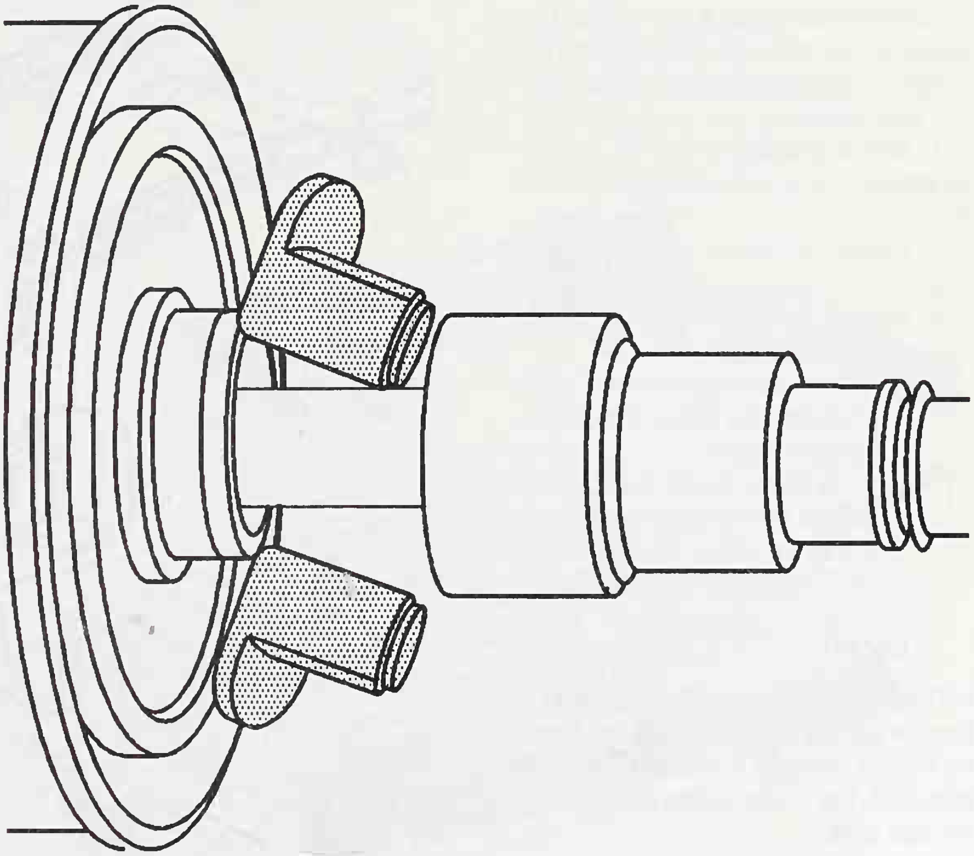
2004 5.3L ENGINE

➡This procedure requires the use of tool J-46363, Fuel Line Release Tool, or equivalent.

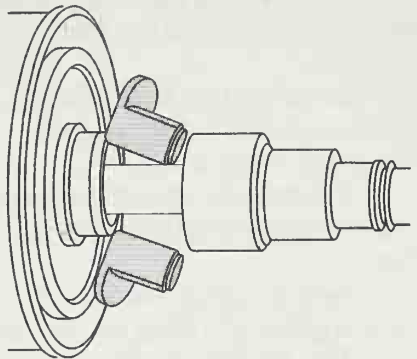
1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Disconnect the negative battery cable.
3. Relieve the fuel system pressure.
4. Raise the vehicle.
5. Remove the fuel composition sensor bracket nuts and reposition it aside.
6. Clean all the fuel filter connections and the surrounding areas before disconnecting the fuel pipes in order to avoid possible contamination of the fuel system.
7. Using a flare nut wrench and backup wrench disconnect the fuel line fitting from the fuel filter.
8. Use the Fuel Line Release Tool, J-46363, or equivalent to disconnect the quick connect fittings as follows:
    a. Pull the quick connect fitting back until the internal retainers hit the filter stop.
    b. Twist one end of J-46363 and insert it between the fitting and the filter
    c. Twist the opposite end of the tool and insert it between the fitting and filter
    d. Once tool J-46363 is inserted, make sure it is parallel to the filter and fitting.
    e. While holding the filter, push the fitting toward the filter in order to disconnect the quick connect fitting.
    f. Remove the fitting from the filter. Remove the tool from the filter.
9. Slide the fuel filter from the bracket.
10. Inspect the fuel pipe O-rings for cuts, nicks, swelling, or distortion. Replace the O-rings if necessary.

To install:

11. Slide a NEW fuel filter into the bracket.
12. While holding the filter, push the fitting towards the filter in order to connect the quick connect fitting.



Twist one end of the fuel line release tool and insert it between the fitting and the fuel filter—2004 5.3L engine



The spin-on fuel filter is serviced in the same manner as a spin-on oil filter

13. Using a flare nut wrench and backup wrench connect the fuel line fitting to the fuel filter.
14. Position the fuel composition sensor/bracket into place and secure with the bracket nuts. Torque the nuts to 13 ft. lbs. (17 Nm).
15. Lower the vehicle

2002–04 Express and Savana

The fuel filter is normally located along the frame rail of the vehicle. On some vehicles however, it may have been relocated to the engine compartment. When in doubt, trace a fuel line from the engine backward or from the tank forward in order to locate the filter.

Some vehicles utilize a spin-on fuel filter located on the frame rail. This filter can be turned counterclockwise after the fuel pressure is relieved.

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Properly relieve the fuel system pressure.
3. Remove or disconnect the following:
   - Negative battery cable
   - Fuel line connections from the filter or unscrew the filter in the case of the spin-on type
   - In line filters, remove the bolt from the filter mounting clamp, then remove the clamp and filter assembly. Separate the filter from the clamp.

To install:

➡The inline filter has an arrow (fuel flow direction) on the side of the case, be sure to install it correctly in the system, with the arrow facing away from the fuel tank.

4. Install or connect the following:
   - In line filters place filter in clamp
   - Install filter and clamp
   - Spin-on filters, lubricate the gasket before installation. Then tighten the filter an additional ¾ of a turn from the point when the gasket touches the filter adapter. Always check for leaks after a new filter is installed.

Fuel Pump

REMOVAL & INSTALLATION

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Remove or disconnect the following:
   - Negative battery cable
3. Relieve the fuel system pressure.
4. Drain the fuel tank.
5. Remove or disconnect the following:
   - Fuel tank

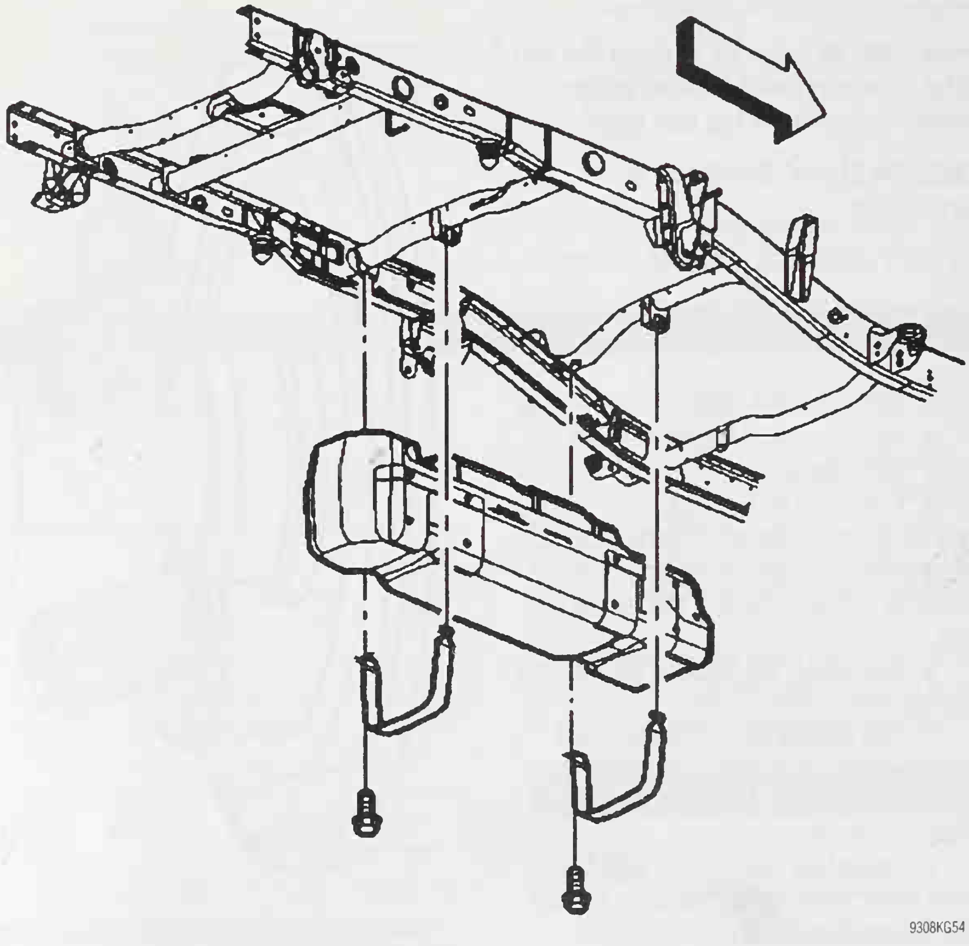
⁂ WARNING

Do not handle the fuel sender assembly by the fuel pipes. The amount of leverage generated by handling the fuel pipes could damage the joints.

   - Fuel sender assembly retaining ring using a fuel tank sending unit wrench. Remove the fuel sender assembly and the seal. Discard the seal.
6. Note the position of the fuel strainer on the fuel sender. Support the fuel sender assembly with one hand and grasp the strainer with the other hand. Pull the strainer off the fuel sender. Discard the strainer after inspection. Inspect the strainer. Replace a contaminated strainer and clean the fuel tank.
   - Fuel pump electrical connector
   - Electrical connector retaining clip from the fuel level sensor
   - Sensor electrical connector from under the fuel sender cover
   - Fuel level sensor retaining clip
7. Squeeze the locking tangs and remove the fuel level sensor.
8. Remove the fuel pressure sensor.

To install:

9. Install or connect the following:
   - Fuel pressure sensor
   - Fuel level sensor
   - Sensor retaining clip
   - Electrical connector to the fuel level sensor
   - Electrical connector retaining clip to the fuel level sensor
   - Fuel pump electrical connector



Fuel tank—Silverado shown

➡Always install a new fuel strainer when replacing the fuel tank fuel pump module.

- New fuel strainer in the same position as noted during disassembly. Push the strainer on the bottom of the fuel sender until the strainer is fully seated.
- New seal on the fuel tank

➡The fuel pump strainer must be in a horizontal position when the fuel sender is installed in the tank. When installing the fuel sender assembly, assure that the fuel pump strainer does not block full travel of the float arm.

- Fuel sender assembly into the fuel tank
- Fuel sender assembly retaining ring
- Fuel tank. Install the fuel tank strap attaching bolts. Tighten the bolts to 30 ft. lbs. (40 Nm).

10. Refill the fuel tank. Install the fuel filler cap. Connect the negative battery cable.

11. Turn the ignition **ON** for 2 seconds.

12. Turn the ignition **OFF** for 10 seconds.

13. Turn the ignition **ON**.

14. Inspect for fuel leaks.

Fuel Injector

REMOVAL & INSTALLATION

4.3L Engines

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.

➡Use care when removing the injectors to prevent damage to the electrical connector pins on the injector and the nozzle. The fuel injector is serviced as a complete assembly only. Since the injector is an electrical component, it should not be immersed in any type of cleaner.

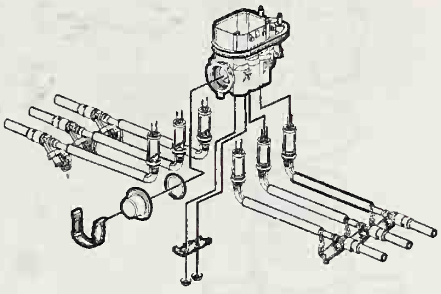
2. Relieve the fuel system pressure.

3. Remove the upper intake manifold.

4. Remove and discard the fuel meter body seal.

5. Before removal, clean the fuel meter body with a spray type engine cleaner, if necessary. Follow the package instructions. Do not soak the fuel meter body in liquid cleaning solvent.

➡When disconnecting the injectors, remember the sequence in order to ensure correct injector placement to each cylinder.



Exploded view of the fuel injector assembly—4.3L engine

6. Remove the injectors from the lower intake manifold bores. Lightly pull on the injector tube and using a small pocket screwdriver, remove the injector from the manifold.

7. Remove the MFI (multi-port flexible injection) fuel meter body from the MFI bracket.

8. Remove the injector retainer lock nuts and retainer.

9. While pulling the fuel injector downward, push with a small tip punch down between the injector terminals until the injector is removed.

To install:

10. Lubricate the NEW injector O-ring seals with clean engine oil.

11. Install the fuel injector into the fuel meter body injector socket.

12. Install the injector retainer and the injector retainer lock nuts and tighten to 27 inch lbs. (3 Nm).

13. Position the fuel tubes of the MFI fuel meter body in the forward position.

14. Install the MFI fuel meter body into the fuel meter body bracket on the lower intake manifold. Push down firmly to lock the fuel meter body into the fuel meter body bracket.

15. Insert the injectors into the correct injector bore in the lower manifold.

16. Insure the electrical connectors on the injectors are positioned so that they do not interfere with each other and are pointing towards the center of the intake manifold. Rotate the electrical connectors inboard if necessary

17. Lubricate the upper intake manifold O-ring on the fuel meter body with clean engine oil.

18. Install the upper intake manifold.

19. Tighten the fuel fill cap.

20. Connect the negative battery cable.

21. Turn the ignition ON, with the engine OFF, for 2 seconds.

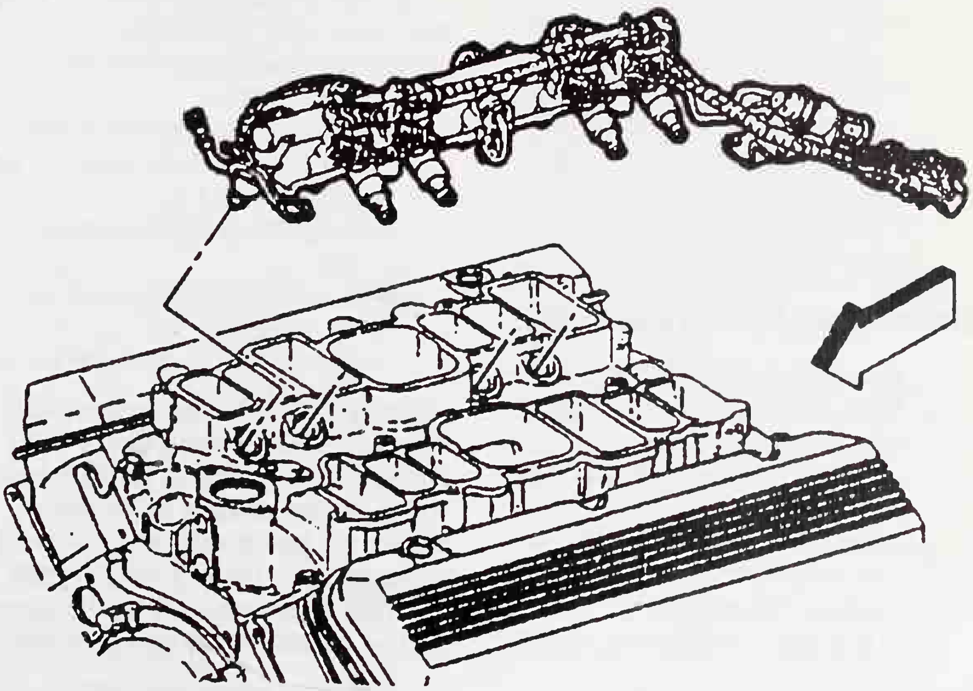
22. Turn the ignition OFF for 10 seconds.

23. Turn the ignition ON, with the engine OFF.

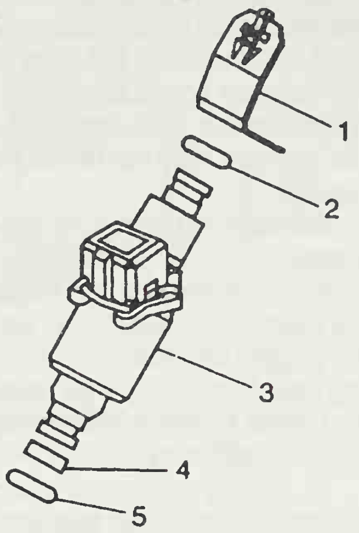
24. Inspect for fuel leaks.

5.0L and 5.7L Engines

1. Remove or disconnect the following:
    - Negative battery cable
    - Intake manifold plenum
    - Fuel rail assembly
    - Wiring harness
    - Injector clip and discard it
    - Injector O-ring seals from both



Exploded view of the fuel rail assembly—MFI systems



1. Clip - SFI Fuel Injector Retainer
2. O-ring - SFI Fuel Injector Upper
3. Injector Asm - SFI Fuel
4. O-ring - Backup
5. O-ring - SFI Fuel Injector Lower

Exploded view of the fuel injector assembly—MFI systems

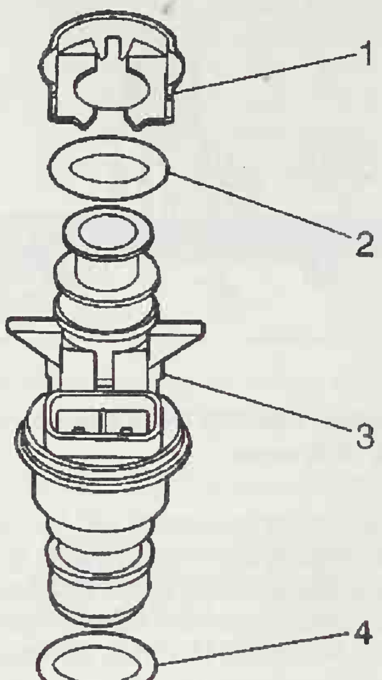
ends of the injector. Save the O-ring backups for use on reassembly

To install:

2. Install or connect the following:
   - O-ring backups before installing the O-rings
3. Lubricate the new injector O-rings with clean engine oil
   - O-ring to injector assembly
   - Fuel injector into the fuel rail injector socket with the electrical connectors facing outward
   - New injector retaining clips on the injector fuel rail assembly by sliding the clip into the injector groove as it snaps onto the fuel rail
   - Fuel rail assembly
   - Manifold plenum
   - Wiring harness
   - Negative battery cable

2002–04 4.8L, 5.3L and 6.0L Engines

1. Relieve the fuel system pressure.
2. Remove or disconnect the following:
   - Negative battery cable
   - Engine sight shield bolts and bracket
   - Accelerator control and cruise control cables from the cable bracket and throttle body
   - Upper engine wire harness retainer nut
   - Evaporative Emission (EVAP) purge valve harness connector



1. Retainer clip
2. O-ring
3. Injector
4. O-ring

Fuel injector—4.8L, 5.3L and 6.0L engines

3. Position the upper engine wire harness aside
4. Tag the injector connectors for identification, then pull the top part of the injector connector up. Do not pull the top part of the connector past the top of the white portion.
5. Push the tab on the lower side of the injector connector to release the connect from the injection. Perform these steps on each injector connector.
6. Remove or disconnect the following:
   - Fuel feed and return pipes from the fuel rail
   - Fuel pressure regulator vacuum line
   - Crossover tube-to-right fuel rail retainer screw
   - Fuel rail attaching bolts and fuel rail

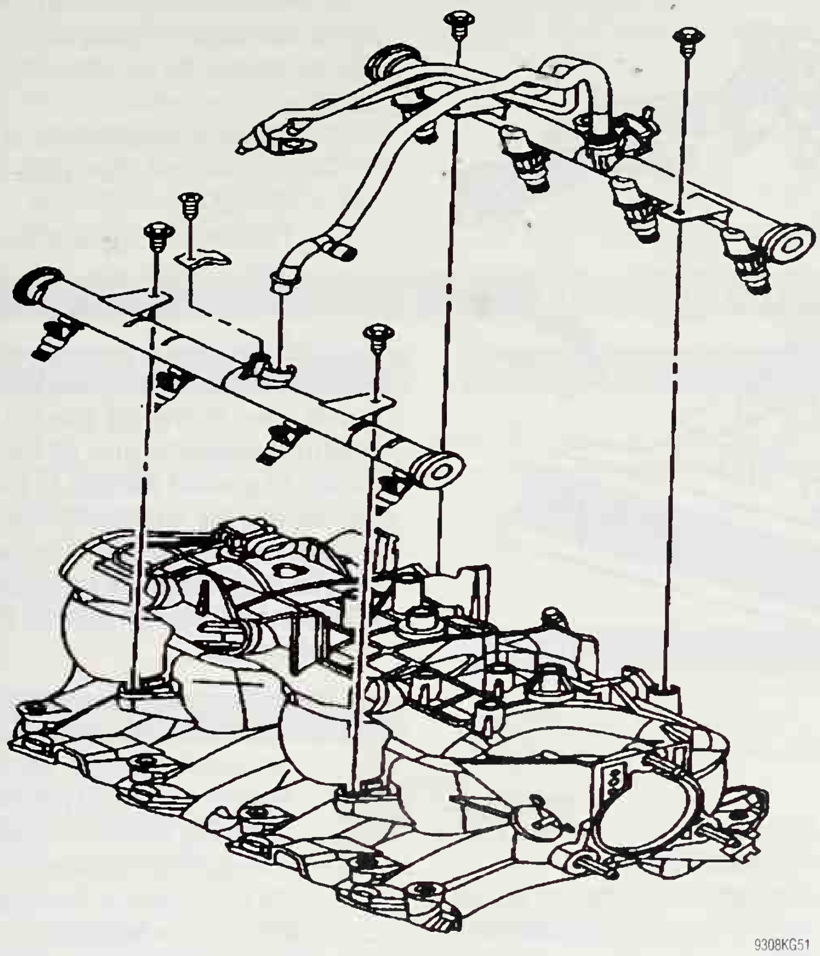
➡Use care in removing the fuel injectors in order to prevent damage to the electrical connector pins on the injector and to prevent damage to the nozzle. Service the fuel injector as a complete assembly only. The fuel injector is an electrical component. DO NOT immerse the fuel injector in any type of cleaner.

   - Injector retainer clip. Insert the fork of a fuel injector assembly removal tool behind the injector connector between the fuel rail pod and the 3 protruding retaining clip ledges. Use a prying motion while inserting the tool in order to force the injector out of the fuel rail pod.
   - Injector retainer clip
   - Injector O-ring seals from both ends of the injector. Discard the O-ring seals.

To install:

➡When ordering new fuel injectors, be sure to order the correct injector for the application being serviced. The fuel injector assembly is stamped with a part number identification.

7. Lubricate the new injector O-ring seals with clean engine oil.
8. Install or connect the following:
   - New injector O-ring seals on the injector
   - New retainer clip on the injector
9. Push the fuel injector into the fuel rail injector socket with the electrical connector facing outward. The retainer clip locks on to a flange on the fuel rail injector socket.
10. Remove the crossover tube-to-right fuel rail retainer, then remove the crossover tube.
11. Replace the crossover tube O-ring with a new, lubricated one.
12. Install or connect the following:
   - Crossover tube and loosely install the retainer
   - Fuel rail to the intake manifold
   - Apply a 0.020 in. (5mm) band of threadlock to the fuel rail retaining bolts
   - Fuel rail bolts and tighten to 89 inch lbs. (10 Nm)
   - Crossover pipe retainer and tighten to 34 inch lbs. (3.8 Nm)
   - Fuel pressure regulator vacuum line
   - Fuel feed and return pipes
   - Fuel injector electrical connectors, as tagged. Rotate the injectors as necessary to avoid stretching the wire harness.
   - Upper engine wire harness
   - EVAP purge solenoid electrical connector
   - Upper engine wire harness retainer nut and tighten to 49 inch lbs. (5.5 Nm)
   - Accelerator control and cruise control cables
   - Engine sight shield mounting bracket and bolts
13. Tighten the fuel cap.



Fuel rail assembly—4.8L, 5.3L and 6.0L engines

14. Connect the negative battery cable.
15. Turn the ignition **ON** for 2 seconds.
16. Turn the ignition **OFF** for 10 seconds.
17. Turn the ignition **ON**.
18. Inspect for fuel leaks.
19. Install the engine sight shield. Tighten the engine sight shield bolts to 89 inch lbs. (10 Nm)

2005–06 4.8L, 5.3L and 6.0L Engines

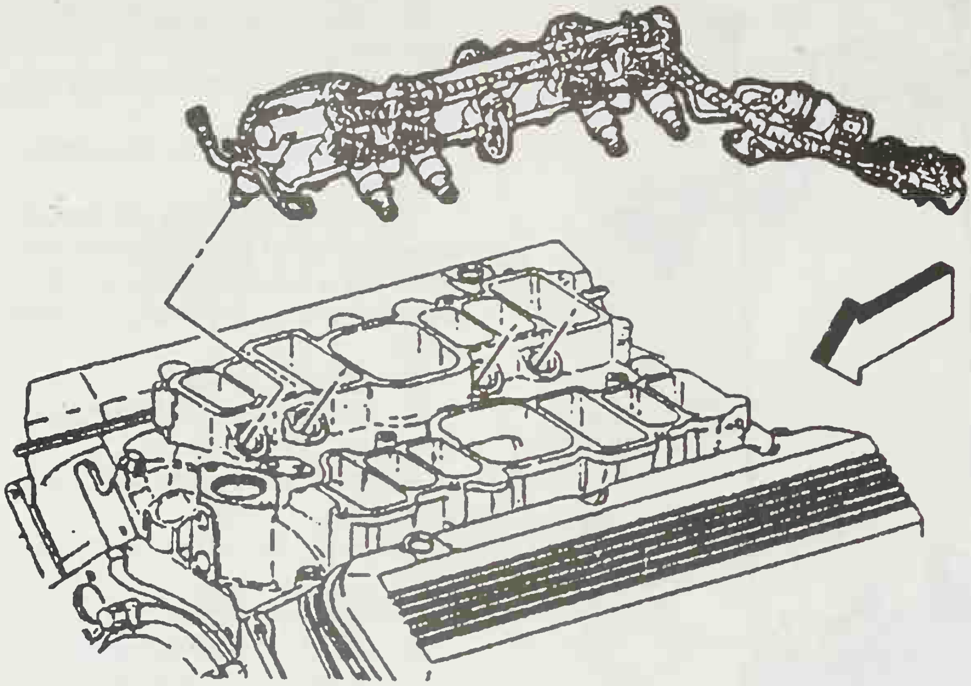
1. Relieve the fuel system pressure.
2. Disconnect the negative battery cable.
3. Remove the wire harness bracket nut.
4. Disconnect the evaporative emission (EVAP) purge solenoid electrical connector.
5. Disconnect the generator electrical connector.
6. Disconnect the Manifold Absolute Pressure (MAP) sensor and the knock sensor connectors.
7. Remove the knock sensor harness connector from the intake manifold.
8. Disconnect the electronic throttle control (ETC) electrical connector by disengaging the gray retainer, push down the black clip and disconnect the connector.
9. Remove the connector position assurance (CPA) retainer.
10. Disconnect the main coil and fuel injector connectors from the right side of the engine.
11. Remove the harness clips from the fuel rail
12. Remove the CPA retainer from the left side of the engine.
13. Disconnect the main coil and fuel injector connectors from the left side of the engine.
14. Remove the harness clips from the fuel rail.
15. Reposition the engine wire harness aside.
16. Mark the injector connectors to their corresponding injectors to ensure correct reassembly.
17. Pull the connector position assurance (CPA) retainer on the connector up 1 click.
18. Push the tab on the connector in.
19. Disconnect the fuel injector electrical connector. Repeat the steps for each injector electrical connector.
20. Remove the positive crankcase ventilation (PCV) hose.
21. Disconnect the fuel feed pipe from the fuel rail.
22. Remove the fuel rail.
23. Remove and discard the fuel injector lower O-ring seal from each injector.

To install:

24. Lubricate the new injector O-ring seals with clean engine oil.
25. Install the new injector O-ring seals onto the fuel injector.
26. Install a new retainer clip onto the fuel injector.
27. Push the fuel injector into the fuel rail injector socket with the electrical connector facing outward. The retainer clip locks onto a flange on the fuel rail injector socket.
28. Install the fuel rail.
29. Apply a 5 mm bead of threadlock to the threads of the fuel rail bolts.
30. Install the fuel rail bolts and tighten to 89 inch lbs. (10 Nm).
31. Connect the fuel feed pipe to the fuel rail.
32. Install the PCV hose.
33. Install the fuel injector electrical connectors to their corresponding injectors to ensure correct reassembly.
34. Connect the fuel injector electrical connector.
35. Push the CPA retainer on the connector in 1 click.
36. Repeat the steps for each injector electrical connector.
37. Position the engine wire harness.
38. Install the harness clips to the fuel rail.
39. Connect the main coil and fuel injector connectors to the left side of the engine.
40. Install the CPA retainer to the left side of the engine.
41. Install the harness clips from the fuel rail
42. Connect the main coil and fuel injector connectors to the right side of the engine.
43. Install the connector position assurance (CPA) retainer.
44. Connect the electronic throttle control (ETC) electrical connector.
45. Install the knock sensor harness connector to the intake manifold.
46. Connect the Manifold Absolute Pressure (MAP) sensor and the knock sensor connectors.
47. Connect the generator electrical connector.
48. Connect the evaporative emission (EVAP) purge solenoid electrical connector.
49. Install the wire harness bracket nut.
50. Connect the negative battery cable.

5.0L and 5.7L Engines

1. Remove or disconnect the following:
    - Negative battery cable
    - Intake manifold plenum



9308KG05

Exploded view of the fuel rail assembly—MFI systems

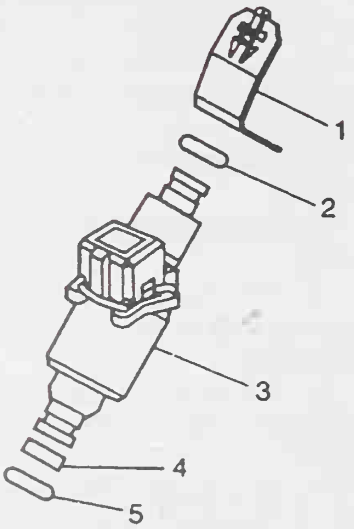
- Fuel rail assembly
- Wiring harness
- Injector clip and discard it
- Injector O-ring seals from both ends of the injector. Save the O-ring backups for use on reassembly

To install:

2. Install or connect the following:
   - O-ring backups before installing the O-rings
3. Lubricate the new injector O-rings with clean engine oil
   - O-ring to injector assembly
   - Fuel injector into the fuel rail injector socket with the electrical connectors facing outward
   - New injector retaining clips on the injector fuel rail assembly by sliding the clip into the injector groove as it snaps onto the fuel rail
   - Fuel rail assembly
   - Manifold plenum
   - Wiring harness
   - Negative battery cable

8.1L Engine

1. Relieve the fuel system pressure.
2. Remove or disconnect the following:
   - Negative battery cable
   - Engine sight shield nuts and bracket
   - Alternator harness connector
   - Evaporative Emission (EVAP) purge valve harness connector
   - Throttle Position (TP) sensor electrical connector
   - Electronic Throttle Control (ETC) electrical connector
   - Upper engine wire harness bracket studs, and position the harness aside
3. Tag the injector connectors for identification, then pull the top part of the injector connector up. Do not pull the top part of the connector past the top of the white portion.



1. Clip - SFI Fuel Injector Retainer
2. O-ring - SFI Fuel Injector Upper
3. Injector Asm - SFI Fuel
4. O-ring - Backup
5. O-ring - SFI Fuel Injector Lower

9308KG06

Exploded view of the fuel injector assembly—MFI systems

4. Push the tab on the lower side of the injector connector to release the connect from the injector. Perform these steps on each injector connector.
5. Remove or disconnect the following:
   - Fuel feed and return pipes from the fuel rail
   - Fuel pressure regulator vacuum line
   - Fuel rail attaching bolts and fuel rail

➡Use care in removing the fuel injectors in order to prevent damage to the electrical connector pins on the injector and to prevent damage to the nozzle. Service the fuel injector as a complete assembly only. The fuel injector is an electrical component. DO NOT immerse the fuel injector in any type of cleaner.

- Injector retainer clip. Insert the fork of a fuel injector assembly removal tool behind the injector connector between the fuel rail pod and the 3 protruding retaining clip ledges. Use a prying motion while inserting the tool in order to force the injector out of the fuel rail pod.
- Injector retainer clip
- Injector from the fuel rail pod
- Injector O-ring seals from both ends of the injector. Discard the O-ring seals.

To install:

➡When ordering new fuel injectors, be sure to order the correct injector for the application being serviced. The fuel injector assembly is stamped with a part number identification.

6. Lubricate the new injector O-ring seals with clean engine oil.
7. Install or connect the following:
   - New injector O-ring seals on the injector
   - New retainer clip on the injector
8. Push the fuel injector into the fuel rail injector socket with the electrical connector facing outward. The retainer clip locks on to a flange on the fuel rail injector socket.
9. Install or connect the following:
   - Fuel rail to the intake manifold
   - Apply a 0.020 (5mm) band of threadlock to the fuel rail retaining bolts
   - Fuel rail bolts and tighten to 106 inch lbs. (12 Nm)
   - Fuel pressure regulator vacuum line
   - Fuel feed and return pipes

- Fuel injector electrical connectors, as tagged. Rotate the injectors as necessary to avoid stretching the wire harness
- Upper engine wire harness bracket
- Retainer studs to the upper engine wire harness and tighten the nut to 89 inch lbs. (10 Nm)
- Alternator electrical connector
- EVAP purge solenoid electrical connector
- TP and ETC sensor connectors
- Engine sight shield mounting bracket and bolts

10. Tighten the fuel cap.
11. Connect the negative battery cable.
12. Turn the ignition **ON** for 2 seconds.
13. Turn the ignition **OFF** for 10 seconds.
14. Turn the ignition **ON**.
15. Inspect for fuel leaks.
16. Install the engine sight shield. Tighten the engine sight shield bolts to 89 inch lbs. (10 Nm).

DIESEL FUEL SYSTEM

Fuel System Pressure

RELIEVING

Fuel system pressure can be released by wrapping a fuel fitting in a heavy shop towel and slightly loosening the fitting. NEVER perform this with any source of ignition nearby!

Fuel System Air

BLEEDING

1. Open the air bleed valve on the fuel manager/filter.
2. Connect a hose to the air bleed valve and place the other of the hose in a suitable container.

⁂ CAUTION

The diesel/water mixture is flammable and may be hot. To avoid personal injury or property damage, do not allow the diesel/water mixture to come in contact with skin, open flame or a hot engine. Do not overfill the container holding the fuel mixture as heat from a warm engine or any another heat source may cause the fuel to expand and leak from the container that may lead to a fire.

3. Remove the F/SOL fuse from the fuse panel.
4. Crank the engine in short intervals of 10-to-15 seconds until clear fuel is observed at the air bleed hose (wait for 1 minute between cranking intervals)
5. Remove the hose and close the air bleed valve.
6. Install the F/SOL fuse and start the vehicle. Allow the vehicle to run at idle for 5 minutes.
7. Check for fuel leaks, and clear any Diagnostic Trouble Code's (DTC's)

Idle Speed

ADJUSTMENT

Idle speed and injection timing is controlled by the PCM. There is no provision for adjustment.

Fuel Filter

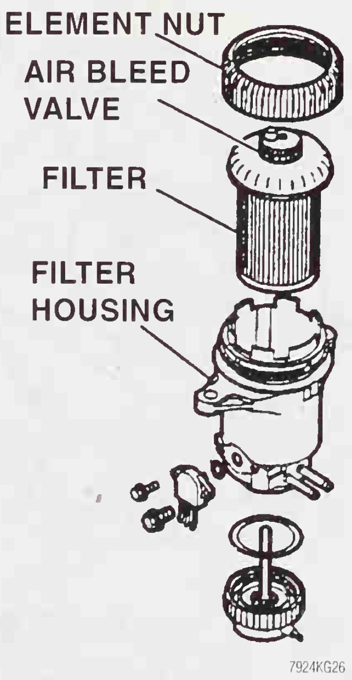
REMOVAL & INSTALLATION

6.5L Engine

1. Turn the ignition **OFF**. Remove the fuel tank cap to release any pressure or vacuum in the tank.

➡It is not necessary to drain all the fuel from the header in order to change the element since the fuel will remain in the header's cavity.

2. Remove or disconnect the following:
   - Open the air bleed valve to relieve residual pressure
   - Element nut, turning it by hand to the left. If necessary, a strap wrench may be used to loosen the nut.
   - Element by lifting straight up and out of the header assembly



Exploded view of the fuel filter assembly—6.5L diesel engines

To install:

3. Be sure the mating surface between the element assembly and the header assembly is clean.
4. Install or connect the following:
   - New element by aligning the widest key slot located under the element assembly cap with the widest key in the header assembly.
5. Carefully push the element downward until the mating surfaces make contact.
   - Element nut and tighten securely by hand
6. If not already done, open the air bleed valve on top of the fuel manager/filter assembly, then connect a length of hose placing the other end in a suitable container.

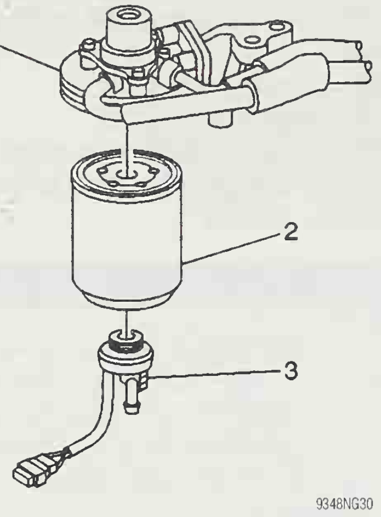
⁂ CAUTION

Be extremely cautious when handling diesel fuel. Do not expose the fuel to sparks or open flames. Also, be cautious as the fuel coming out of the drain hose could be hot.

7. Disconnect the fuel injection pump shutdown solenoid wire.
8. Crank the engine for 10–15 seconds, then wait 1 minute for the starter motor to cool. Repeat until clear fuel is observed coming from the air bleed.
9. Close the air bleed valve, reconnect the injection pump solenoid wire and replace the fuel tank cap.
10. Start the engine, allow it to idle for 5 minutes and check the fuel manager/filter assembly for leaks.

6.6L Engine

1. Disconnect the negative battery cables.
2. Drain the fuel from the fuel filter as follows:



Exploded view of the fuel filter (2)—6.6L engine

a. Install a hose on the water drain on the water-in-fuel sensor.

b. Place the other end of the hose into an approved container.

c. Drain as much fuel as possible from the fuel filter housing.

d. Tighten the water drain on the water-in-fuel sensor.

3. Remove or disconnect the following:
   - Water-in-fuel sensor harness connector
   - Fuel filter from the fuel filter/heater element housing
   - Water-in-fuel sensor from the fuel filter

To install:

4. Install or connect the following:
   - Water-in-fuel sensor in the fuel filter

➡Check the fuel filter/heater element housing and the filter for a dislocated filter seal or foreign debris. Contamination on the filter/heater housing may cause leakage at the fuel filter. Coat the seal with clean engine oil.

   - Fuel filter on the fuel filter/heater element housing
   - Water-in-fuel harness connector
   - Negative battery cables

5. Prime the fuel system:

a. Pump the primer located on top of the fuel filter 30 times or until stiff.

b. Try to start and run the engine. If the engine does not start, repeat the previous step.

c. Allow the engine to run for 5 minutes at idle

d. Check for fuel leaks and clear all Diagnostic Trouble Codes (DTCs).

Diesel Injection Pump

All vehicles are equipped with an electronically controlled pump. The electronic pump is driven by gears and rotates at the same speed as the camshaft. An electronic stepper motor used to control injection timing and a fuel solenoid driver used to control the fuel injection solenoid on the electronic model.

REMOVAL & INSTALLATION

6.5L Engine

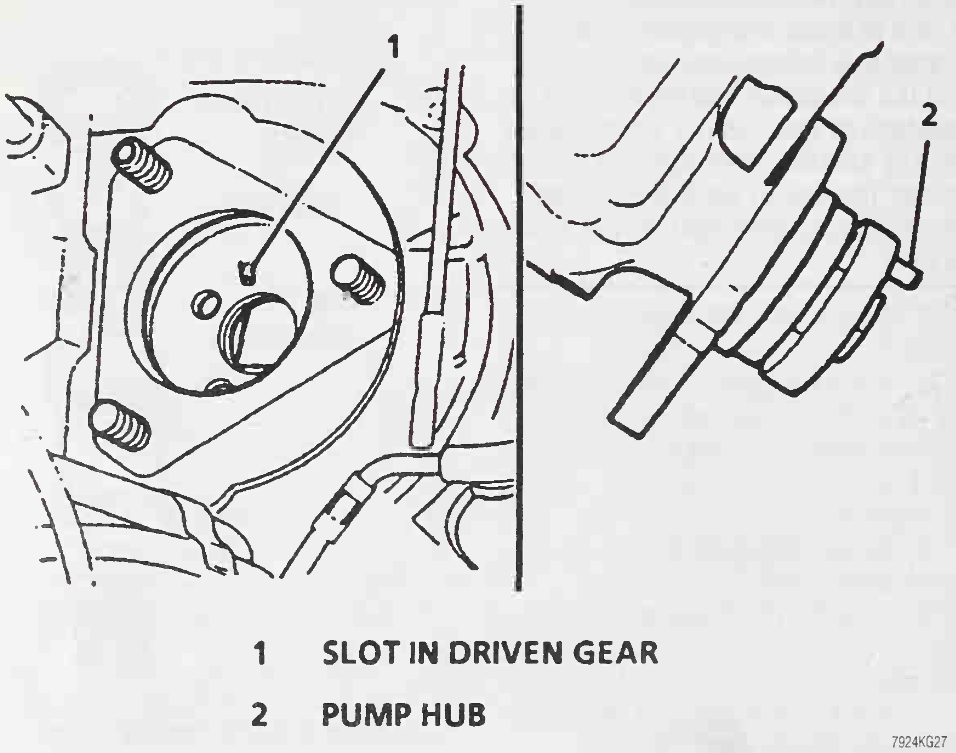
1. Relieve the fuel system pressure.
2. Remove or disconnect the following:
   - Negative battery cables
   - Intake manifold
   - Fuel injection and inlet lines
   - Cables wires, and hoses at the injection pump
   - Fuel return line at the top of the injection pump
   - Fuel feed line at the injection pump, if necessary
   - Oil filler tube grommet

➡Do not engage the starter in order to rotate the engine with the injection pump removed. The pump driven gear could jam in the front housing resulting in a sheared crankshaft or camshaft gear key and possible valvetrain damage.

3. Scribe or paint a matchmark on the front cover and the injection pump flange.
4. Rotate the crankshaft by hand and remove the injection pump driven gear bolts, accessing the bolts through the oil filler neck hole.
5. Remove the injection pump-to-front cover attaching nuts. Remove the pump. Be sure to cap all open lines and nozzles in order to prevent system contamination and damage.

To install:

6. Align the locating pin on the pump hub with the slot in the injection pump driven gear (the SLOT not the hole in the gear) At the same time, align the timing marks.
7. Attach the injection pump to the front cover. Torque the nuts to 30 ft. lbs. (40 Nm) checking the timing marks before tightening.
8. Install or connect the following:
   - Driven gear-to-injection pump bolts and tighten to 20 ft. lbs. (27 Nm)
   - Grommet and oil fill tube
   - Air conditioning bracket, if applicable
   - Fuel feed line. Torque to 20 ft. lbs. (27 Nm).
   - Fuel return line to the pump, if removed
   - Cables, wires and hoses previously removed
   - Injector lines
   - Intake manifold



Align the pin on the pump hub with the slot in the driven gear, NOT into the hole in the gear—diesel engines

- Negative battery cables

9. Start the engine and check for leaks.

6.6L Engine

1. Drain the cooling system
2. Remove or disconnect the following:
    - Negative battery cables
    - Air intake duct. Cover the end to prevent dirt from entering
    - Intake manifold cover
    - Fuel fill cap in order to relieve the fuel pressure
    - Fuel injection control module (FICM) electrical connectors
    - Fuel injection control module
    - Upper fan shroud
    - Fan blade assembly
    - Drive belt
    - Bolt holding the positive battery cable junction box and bracket and position aside
    - A/C compressor and power steering pump and position aside with the lines attached
    - Oil dipstick tube
    - A/C and power steering pump bracket
    - Drive belt tensioner and bolt.
    - Alternator
    - Thermostat housing bracket, wiring and fuel test port and 2 nuts
    - Positive Crankcase Ventilation (PCV) catch tank from the PCV bracket and the bolt below holding the lower line, then position aside
    - Alternator bracket
    - Turbo cooling hose return line clamp and hose
    - Upper radiator hose at the outlet pipe. Remove the bracket and support the bracket at the valve cover and swing out of the way
    - Bolt holding the wiring support bracket at the thermostat housing
3. Move the main wiring harness by disconnecting the following:
    a. The fuel pressure regulator connector on the fuel injection pump
    b. Fuel injection control module connectors
4. Flip the wire harness and harness tray towards the back and position aside.
5. Remove or disconnect the following:
    - Heater pipe bolt and temperature sensor wire from the thermostat housing
    - Air intake pipe
    - Water crossover assembly
    - Hose from the turbo water feed line

➥Cap all open fuel connections to prevent contaminants from entering.

- High pressure fuel lines and support pipe and hose at the fuel injection pump and junction block
- Fuel return hose from the fuel injection pump
- Y-junction banjo fitting from the junction block
- Bolts securing the fuel injection pump at the front cover and block

➥When removing the pump, be careful not to damage any of the mating surfaces.

- Fuel injection pump from the block using 2 prytools to work the pump from the block toward the rear of the engine, keeping the pump straight.

6. Prepare the fuel pump as follows:
    a. Hold the fuel pump by the drive gear in a vise with copper jaw liners.
    b. Loosen the gear nut until the nut is even with the end of the gear shaft.
    c. Separate the pump and adapter by removing the 3 bolts and spacers.
    d. Inspect the O-ring for damage on the pump adapter and replace if necessary. Lubricate the O-ring with clean engine oil.
    e. Clean all mating surfaces.
    f. Install the adapter on the pump
    g. Using the bolts and spacers, reassemble the pump. Tighten the bolts to 15 ft. lbs. (20 Nm).
    h. Install the gear and nut and tighten to 52 ft. lbs. (70 Nm).

To install:

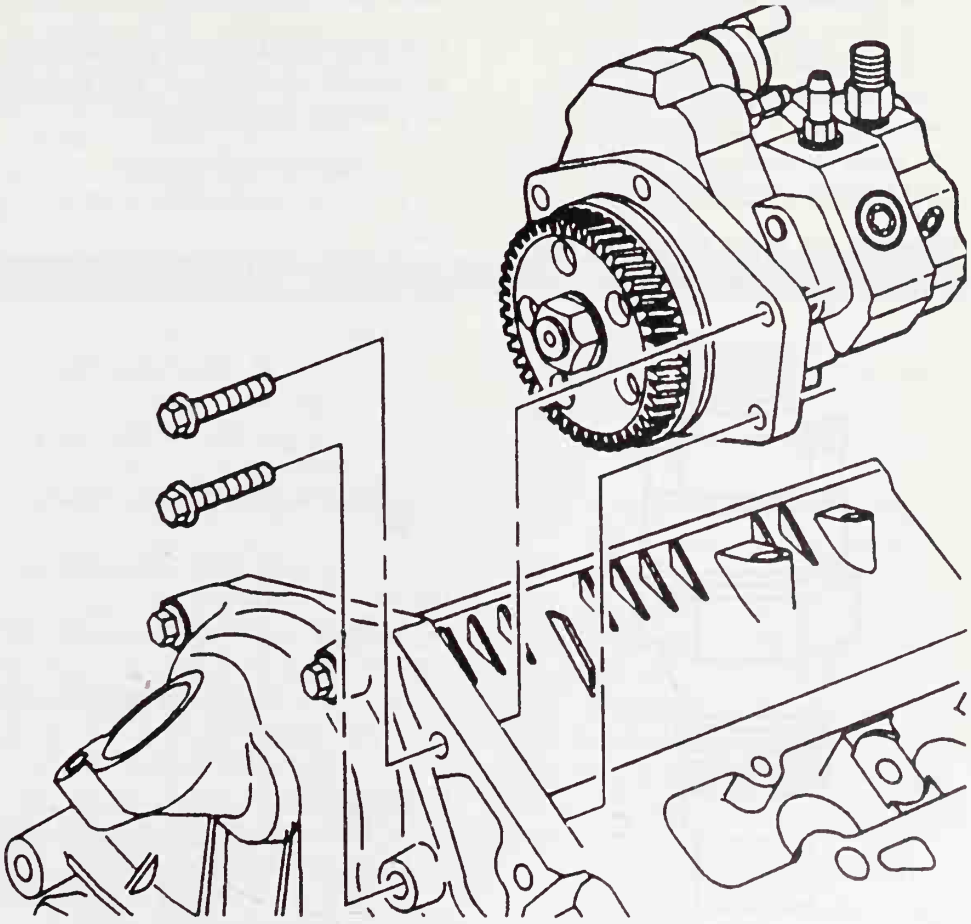
7. Installation is the reverse of removal, noting the following tightening specifications:
    - Fuel injection pump mounting bolts: 15 ft. lbs. (20 Nm)
    - Y-junction banjo fitting: 11 ft. lbs. (15 Nm)
    - High pressure fuel lines: 40 ft. lbs. (54 Nm)
    - Heater pipe bracket and water crossover bolts: 15 ft. lbs. (20 Nm)
    - Upper radiator hose mounting bolts: 89 inch lbs. (10 Nm)
    - A/C and power steering pump bracket bolts: 34 ft. lbs. (46 Nm)
8. Refill the cooling system, then start the engine and check for leaks.

Fuel Injectors

REMOVAL & INSTALLATION

6.5L Engine

➥Special tool J–29873, or its equivalent, an injection nozzle socket, will be necessary for this procedure.



Diesel fuel injection pump—6.6L engine

1. Remove or disconnect the following:
    - Batteries.
    - Fuel line clip(s)
    - Fuel return hose
    - Fuel injection lines
2. Using GM special tool J–29873, remove the injector. Always remove the injector by turning the 30mm hex portion of the injector; turning the round portion will damage the injector. Always cap the injector and fuel lines when disconnected, to prevent contamination.

To install:

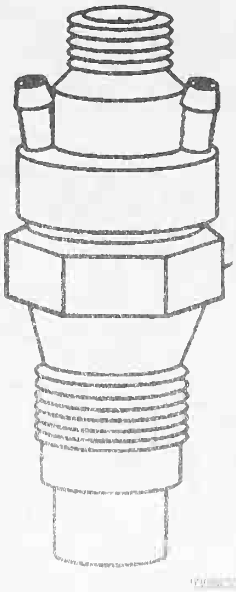
3. Always install the injector by turning the 30mm hex portion of the injector; turning the round portion will damage the injector.
4. Install or connect the following:
    - Injector with a new gasket. Torque to 50 ft. lbs. (70 Nm).
    - Injection line. Torque the nut to 20 ft. lbs. (25 Nm).
    - Fuel return hose
    - Fuel line clip(s)
    - Batteries

2002–04 6.6L Engine

➡Special tool J 44639, or equivalent, an injector removal tool, will be necessary for this procedure.

1. Remove or disconnect the following:
    - Negative battery cables
    - Lower valve cover
    - Spill line from the injectors
    - Retainer bolt from the injector bracket
2. Install the fuel injector removal tool onto the injector retainer bracket.

➡Check to see which side of the banjo washers have the largest hole.



View of the fuel injector nozzle.

3. Install a wrench on the fuel injector removal tool and pry away from the injector.
4. Remove the faulty injectors.
5. Remove the copper compression washer from the injection hole if the washer did not come off with the injector.

To install:

6. If the injector sleeve is pulled from the cylinder head when removing the injector, the injector sleeve must be installed as follows:
    a. Set the new injector sleeve gaskets to the injector sleeve.
    b. Apply threadlock to the lower sealing area of the injector sleeve.
    c. Use a large brass drift to drive the injector sleeve into the cylinder head until fully seated.
7. Replace the copper compression washer. Assembly grease may be needed to hold the washer in place.
8. Install or connect the following:
    - New injectors
    - Retainer bolt on the injector bracket. Tighten to 36 ft. lbs. (46 Nm).
    - Spill line and tighten the bolts to 108 inch lbs. (12 Nm)
    - Lower valve cover
    - Negative battery cables

2005–06 6.6L Engine

➡Special tool J-46594, or equivalent, an injector removal tool, will be necessary for this procedure.

1. Drain the cooling system.
2. Disconnect the negative battery cable.
3. On the left side, remove the charged air cooler inlet duct connector from the turbocharger.
4. Remove the main engine electrical harness connectors.
5. Disconnect the barometric sensor electrical connector.
6. Remove the engine wire harness from the clip.
7. Remove the main electrical harness bracket bolts and bracket.
8. Disconnect the glow plug controller electrical connector.
9. Remove the positive crankcase ventilation (PCV) hose/pipe.
10. On the right side, remove the air cleaner outlet duct.
11. Loosen the charged air cooler outlet duct to intake hose clamp.
12. Remove the charged air cooler outlet duct from the intake.
13. Remove the fuel filter and bracket.
14. Remove the fuel injection control module.
15. Prior to removing the fuel injector pipes, use compressed air to blow any debris from between the injector line and fittings. Wipe the fittings clean of debris.
16. Remove the fuel injector pipes.
17. Remove the fuel return hose from the injectors.
18. Disconnect the fuel injector electrical connectors.
19. Remove the fuel injector bracket bolts.
20. Install the injector removal tool J-46594 into the bolt hole in the fuel injector bracket.
21. Install a flare nut wrench onto the tool and pull back away from the fuel injector, until the injector releases from its seat.
22. Remove the tool.
23. Remove the fuel injectors with brackets.
24. If necessary, remove the fuel injector bracket pins.
25. If necessary, remove and discard the copper washer from the fuel injector bore.
26. If necessary, remove and discard the O-ring from the fuel injector.

To install:

27. If necessary, install a new O-ring onto the fuel injector.
28. If necessary, install a new copper washer to the fuel injector bore.
29. If necessary, install the fuel injector bracket pins.
30. Install the fuel injectors with brackets.
31. Install the fuel injector bracket bolts and tighten to 22 ft. lbs. (30 Nm).
32. Connect the fuel injector electrical connectors.
33. Install the fuel return hose to the injectors.
34. Install the fuel return hose clips.
35. Install the fuel injector pipes and tighten to 30 ft. lbs. (40 Nm).
36. On the left side, install the positive crankcase ventilation (PCV) hose/pipe.
37. Connect the glow plug controller electrical connector.
38. Install the main electrical harness bracket bolts and bracket.
39. Install the engine wire harness to the clip.
40. Connect the barometric sensor electrical connector.
41. Install the main engine electrical harness connectors.
42. Install the charged air cooler inlet duct connector to the turbocharger.
43. On the right side, install the fuel injection control module.

44. Install the fuel filter and bracket.
45. Install the charged air cooler outlet duct to the intake.
46. Tighten the charged air cooler outlet duct to intake hose clamp.
47. Install the air cleaner outlet duct.
48. Connect the negative battery cable.
49. Refill the cooling system.

Glow Plugs

REMOVAL & INSTALLATION

6.5L Engine

1. Disconnect both battery cables.
2. Raise and support the vehicle.
3. On the left side, remove the left front tire.
4. Remove the splash shield from the left front wheel well.
5. Remove the lead wires from the glow plugs in cylinders 1 and 3.
6. Remove the glow plugs from cylinders 1 and 3.
7. Remove the engine cover.
8. From the inside of the vehicle, remove the lead wires from the glow plugs in cylinders 5 and 7.
9. Remove the glow plugs from cylinders 5 and 7.
10. On the right side, remove the right front tire.
11. Remove the splash shield from the right front wheel well.
12. Remove the lead wires from the glow plug in cylinder 2.
13. Remove the lead wires for the glow plugs in cylinders 4 and 6 at the harness connectors.
14. Remove the glow plugs from cylinders 2, 4, and 6.
15. Disconnect the lead wire at the glow plug from cylinder 8 from inside of the vehicle.
16. Remove the glow plug from cylinder 8.

To install:

17. On the right side, install the glow plug into cylinder 8 from inside of the vehicle and tighten to 13 ft. lbs. (17 Nm).
18. Connect the lead wire to the cylinder 8 glow plug.
19. Install the glow plugs into cylinders 2, 4, and 6 by reaching through the right front wheel well and tighten to 13 ft. lbs. (17 Nm).
20. Install the lead wire to glow plug 6.
21. Connect the wires for the glow plugs in cylinders 4 and 6 to the connectors at the wire harness.
22. Install the lead wire for the cylinder 2 glow plug.
23. Install the splash shield in the right front wheel well.
24. Inspect the wire routing, ensuring that the lead wires are not rubbing against the exhaust manifold or any part that may harm the wire insulation.
25. Install the right front tire.
26. On the left side, install the glow plugs into cylinders 1 and 3 by reaching through the left front wheel well and tighten to 13 ft. lbs. (17 Nm).
27. Install the lead wires for cylinder 1 and 3.
28. Install the splash shield in the left front wheel well.
29. Inspect the wire routing, ensuring that the lead wires are not rubbing against the exhaust manifold or any part that may harm the wire insulation.
30. Install the left front tire.
31. Install the glow plugs into cylinders 5 and 7 from inside of the vehicle and tighten to 13 ft. lbs. (17 Nm).
32. Connect the lead wires to the glow plugs.
33. Connect the negative battery cables.
34. Ensure that the PCM electrical harness is properly routed to avoid contact with the engine cover during installation.
35. Install the engine cover.

REMOVAL & INSTALLATION

6.6L Engine

1. Disconnect both battery cables.
2. Remove the left and right wheelhouse panels.
3. Remove the glow plug harness nut(s).
4. Remove the harness from the glow plug(s).
5. Remove the glow plug(s).

To install:

6. Install the glow plugs and tighten to 13 ft. lbs. (17 Nm).
7. Install the harness to the glow plugs.
8. Install the glow plug harness nut(s).
9. Install the left and right wheelhouse panels.
10. Connect both battery cables.

DRIVE TRAIN

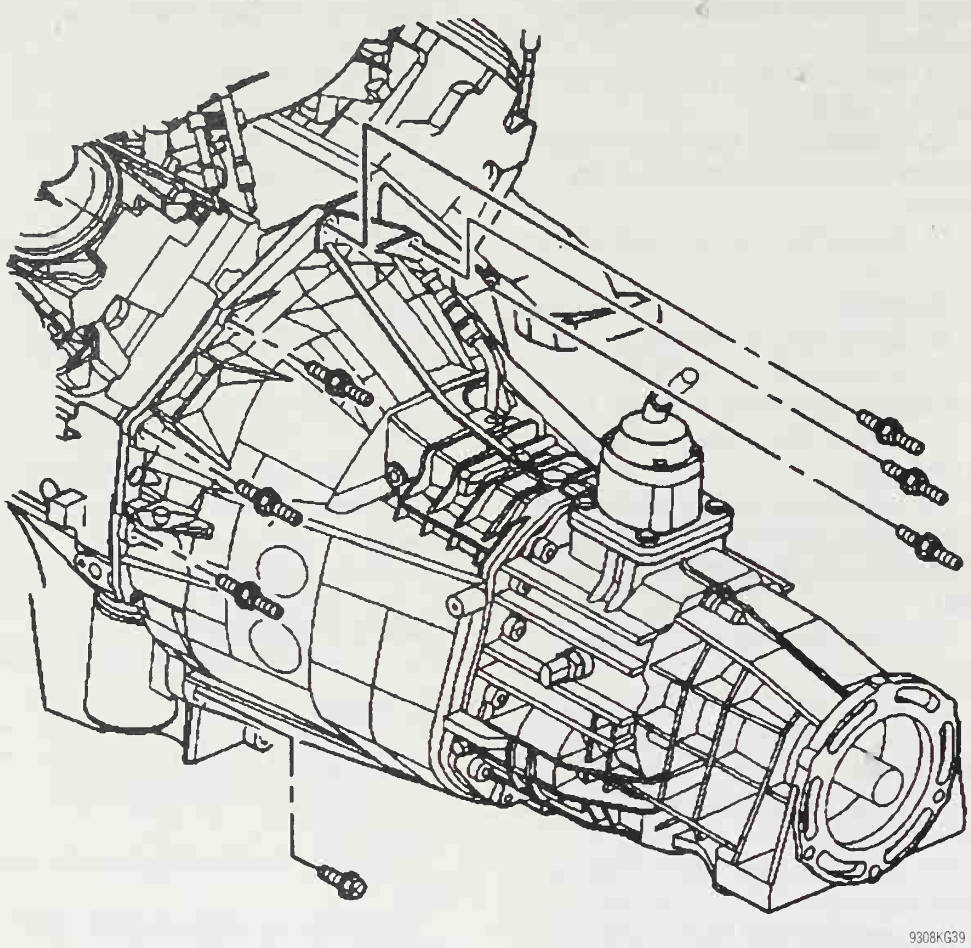
Transmission Assembly

REMOVAL & INSTALLATION

Manual Transmission

SIERRA AND SILVERADO—NV3500

1. Shift the transmission into 3rd or 4th speed gear.
2. Remove or disconnect the following:
   - Shift lever
   - Shift tower
   - Transmission oil
   - If equipped with a transfer case, remove the front propeller shaft
   - Rear propeller shaft.
3. If equipped with a transfer case, remove or disconnect the following:
   - Two transfer case shields
   - Manual transfer case shift linkage
   - Bolt securing the left side support brace to the transmission
   - Bolt and stud securing the left side support brace to the transfer case
   - Bolt securing the right side support brace to the transmission
   - Bolt securing the right side support brace to the transfer case
4. Using tool J42371, push back on the white plastic sleeve on the quick connect in order to separate the hydraulic clutch line from the concentric slave cylinder quick connect.
5. Disconnect the wiring harness and connectors from the vehicle speed sensor, backup lamp switch, and transmission harness retainers.
6. If equipped with a 4.3L engine, remove the two bolts securing the clutch housing cover. Remove the transmission rear mount. Support the transmission with a transmission jack.
7. Remove or disconnect the following:
   - Bolts securing the bottom right side of the transmission to the engine
   - Stud securing the right side of the transmission to the engine
   - Bolt and six studs securing the transmission to the engine
8. Pull the transmission straight back on the clutch hub splines. Do not let the transmission hang from the clutch plate and the clutch cover.
   - Transmission from the vehicle
   - Clutch plate and the clutch cover from the engine flywheel, if required



NV3500 removal—Sierra & Silverado

To install:

9. Install the clutch plate and the clutch cover to the engine flywheel if removed.

10. Ensure the transmission is positioned in the 3rd or 4th speed gear. Rotate the transmission clockwise onto the clutch hub splines. Install the bolt and the studs securing the transmission to the engine. Tighten the bolts to 37 ft. lbs. (50 Nm).

11. Install or connect the following:

- Stud securing the right side of the transmission to the engine and tighten to 37 ft. lbs. (50 Nm)
- Bolts securing the bottom right side of the transmission to the engine and tighten to 37 ft. lbs. (50 Nm)
- Clutch housing cover using the two bolts (4.3L engine). Tighten the bolts to 10 ft. lbs. (14 Nm).
- Transmission rear mount
- Clutch line to the concentric slave cylinder

12. If equipped with a transfer case, install or connect the following:

- Right side support brace-to-transmission bolt and tighten to 37 ft. lbs. (50 Nm)
- Right side support brace-to-transfer case bolts and tighten to 37 ft. lbs. (50 Nm)
- Left side support brace-to-transfer case bolt(s) and stud and tighten to 37 ft. lbs. (50 Nm)
- Left side support brace-to-transmission bolts and tighten to 37 ft. lbs. (50 Nm)
- Manual transfer case shift linkage.
- Two transfer case shields
- Front propeller shaft

13. Install or connect the following:

- The rear propeller shaft.
- The shift tower.
- Transmission with transmission fluid
- Shift lever

SIERRA AND SILVERADO—NV4500

1. Shift the transmission into 3rd or 4th speed gear.

2. Remove or disconnect the following:

- The shift lever
- The shift tower
- The transmission oil
- Front propeller shaft, 4WD only
- Rear propeller shaft
- Two transfer case shields
- Manual transfer case shift linkage, if equipped
- Two bolts securing the right side support bracket to the transmission

3. Using tool J42371, push back on the white plastic sleeve on the quick connect in order to separate the hydraulic clutch line from the concentric slave cylinder quick connect.

- Vehicle Speed Sensor (VSS) connector and harness
- Backup lamp switch connector and harness
- Transmission harness retainers
- Clutch housing cover-to-transmission bolts (4)
- Left and right side transmission-to-engine cover bolts
- Transmission rear mount. Support the transmission with a transmission jack.
- Bolts and studs securing the transmission to the engine.

4. Pull the transmission straight back on the clutch hub splines. Do not let the transmission hang from the clutch plate and the clutch cover. Remove the transmission from the vehicle.

5. Remove the clutch plate and the clutch cover from the engine flywheel if required.

To install:

6. Install or connect the following:

- Clutch plate and the clutch cover to the engine flywheel, if removed

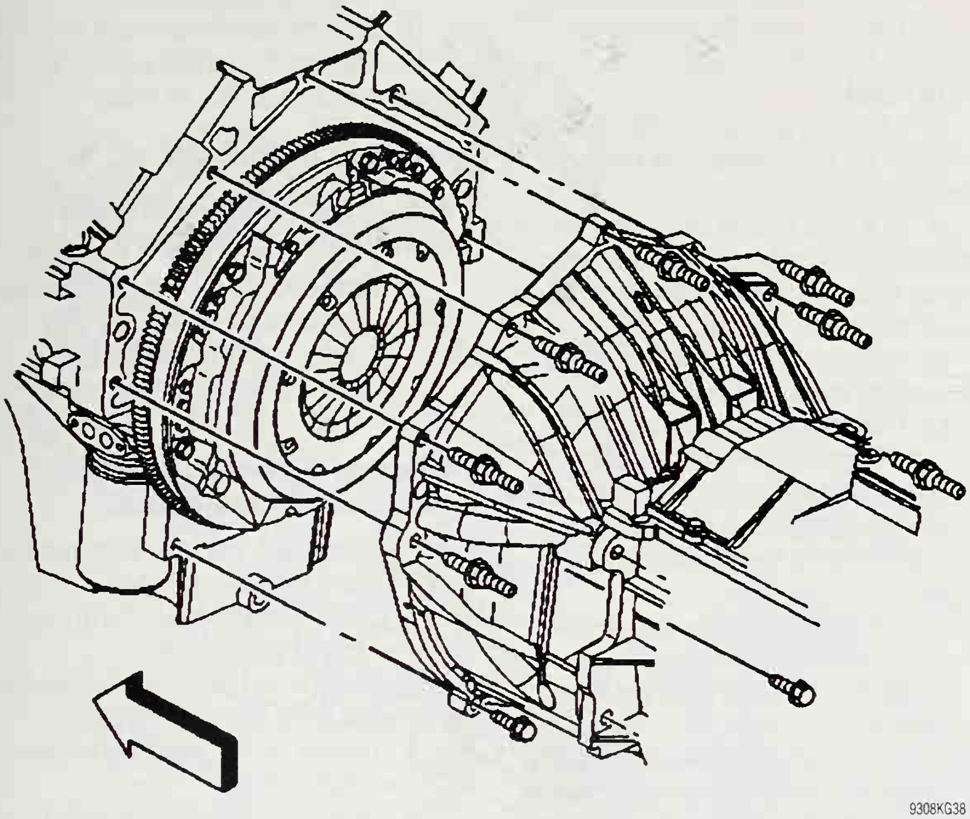
7. Ensure the transmission is positioned in the 3rd or 4th speed gear. Rotate the transmission clockwise onto the clutch hub splines. Install the bolt and the studs securing the transmission to the engine. Tighten the bolts to 37 ft. lbs. (50 Nm).

8. Install or connect the following:

- Right and left side transmission to engine cover bolts and tighten to 10 ft. lbs. (14 Nm)
- Clutch cover-to-transmission bolts and tighten to 10 ft. lbs. (14 Nm)
- Transmission rear mount
- Clutch line to the slave cylinder
- Right side support bracket-to-transmission bolts (2). Tighten to 37 ft. lbs. (50 Nm).
- Manual transfer case shift linkage, if removed
- Two transfer case shields, if equipped
- Front propeller shaft, if equipped
- Rear propeller shaft
- Shift tower
- Transmission with transmission fluid
- Shift lever

SIERRA AND SILVERADO—ZF-S6-650

1. Shift the transmission into 3rd or 4th speed gear.



NV4500 removal—Sierra and Silverado

2. Remove the shift lever.
3. Raise and suitably support the vehicle.
4. If vehicle is a 2 wheel drive (2WD), remove the rear propeller shaft.
5. If equipped with 4 wheel drive (4WD), remove the transfer case.
6. Disconnect the clutch actuator cylinder hydraulic hose quick connect at the master cylinder.
7. Disconnect the clutch actuator cylinder line retaining clips.
8. If equipped with a 6.6L engine, disconnect the power take off, backup lamp and vehicle speed sensor connectors.
9. Remove the engine harness clips from the fuel feed/return brackets.
10. Remove the PTO connector from the fuel feed/return bracket.
11. Reposition the harness.
12. Remove the fuel lines from the fuel feed/return brackets.
13. If equipped with a 8.1L engine, disconnect the power take off, backup lamp, vehicle speed sensor and oxygen sensor connectors.
14. Remove the engine harness clips from the fuel feed/return brackets.
15. Remove the PTO connector from the fuel feed/return bracket.
16. Remove the oxygen sensors connectors from the fuel feed/return hose clip and transmission bracket.
17. Reposition the harness.
18. Remove the fuel lines from the fuel feed/return brackets.
19. If equipped with 4WD, remove the vent hose clip from the bracket.
20. Remove the vent hose clip nut and clip.
21. If equipped with 4WD, remove the vent hose clip from the fuel feed/return bracket.
22. Remove the starter.
23. Remove the exhaust pipe hanger bracket bolts and bracket.
24. Support the transmission with a suitable transmission jack.
25. Remove the transmission support
26. Remove the transmission bolts/studs.
27. Pull the transmission straight back on the clutch hub splines. Do not let the transmission hang from the clutch assembly.
28. Remove the transmission from the vehicle with the clutch hydraulic hose attached to the clutch actuator.
29. Remove the insulator from the top of the transmission.

To install:

30. Install the insulator to the top of the transmission.

➡Connect the clutch actuator cylinder hose quick connect to the master cylinder before the transmission is fully installed. Failure to connect the hose could cause damage to the clutch pressure plate.

31. Slowly feed the clutch hydraulic hose towards the clutch master cylinder and connect the clutch actuator cylinder hydraulic hose quick connect to the master cylinder.
32. Rotate the transmission clockwise onto the clutch hub splines.
33. Position the transmission to the engine. Do not use the transmission bolts to draw up the transmission.
34. Install the transmission studs and tighten to 37 ft. lbs. (50 Nm).
35. Slowly feed the clutch hydraulic hose towards the clutch master cylinder and connect the clutch actuator cylinder hydraulic hose quick connect to the master cylinder.
36. Install the transmission support.
37. Remove the transmission jack.
38. Install the exhaust pipe hanger bracket and bolts.
39. Install the starter.
40. If equipped with 4WD, install the vent hose clip to the fuel feed/return bracket.
41. Install the vent hose clip and nut.
42. Install the vent hose clip to the bracket.
43. Install the fuel lines to the fuel feed/return brackets.
44. Position the harness.
45. Install the oxygen sensors connectors to the fuel feed/return hose clip and transmission bracket.
46. Install the PTO connector to the fuel feed/return bracket.
47. Install the engine harness clips to the fuel feed/return brackets.
48. If equipped with a 8.1L engine, connect the power take off, backup lamp, vehicle speed sensor and oxygen sensor connectors.
49. Connect the clutch actuator cylinder line retaining clips.
50. If equipped with 4WD, install the transfer case.
51. If equipped with a 6.6L engine, connect the power take off, backup lamp and vehicle speed sensor connectors.
52. If vehicle is a 2WD, install the rear propeller shaft.
53. Lower the vehicle.
54. Install the shift lever.
55. Fill the transmission with fluid.
56. Bleed the clutch hydraulic system, if necessary.
57. Connect the battery cables.

EXPRESS AND SAVANA

1. Drain the transmission.
2. Remove or disconnect the following:
    - Negative battery cable
    - Shifter boot and lever
    - Exhaust pipes
    - Parking brake cables
    - Driveshaft, matchmark for reassembly
    - Transfer case, if equipped
    - Transmission to engine braces (vehicles equipped with diesel engines have only 1 brace)
    - Wiring harness at the transmission
3. Support the transmission with a transmission jack.
    - Nut securing the transmission mount to the crossmember
4. Position a transmission jack or equivalent, under the transmission for support.
    - Crossmember. Visually inspect to see if other equipment, brackets or lines, must be removed to permit removal of transmission.

➡Mark position of crossmember when removing to prevent incorrect installation. The tapered surface should face the rear.

5. Except the NV 3500, remove the top 2 transmission to housing bolts and insert 2 guide pins.

➡The clutch housing on the NV 3500 is integral with the transmission as is the converter housing on the automatic transmissions.

6. On the NV 3500, remove the bolts securing the clutch housing to the engine.

➡The use of guide pins will not only support the transmission but will prevent damage to the clutch disc. Guide pins can be made by using 2 bolts, the same as those just removed only longer, and cutting off the heads. Make an adjustment slot. Be sure to support the clutch release bearing and support assembly during removal of the transmission.

7. Remove the remaining bolts and slide transmission straight back from engine. Use care to keep the transmission drive gear straight in line with clutch disc hub.
8. Remove or disconnect the following:
    - Wiring, clips, tubes and brackets etc., which would interfere with the removal of the transmission

➡Ensure that the engine is supported with a jack stand before detaching the transmission from the engine.

- Transmission from the engine

9. Carefully lower the transmission using the transmission jack.

To install:

10. Check the area behind the torque converter for leaks. Replace the front seal, if required.
11. It is good practice to examine the area around the rear crankshaft seal, checking for leaks. If necessary, remove the flywheel and replace the seal.
12. Inspect the flywheel ring gear teeth. If damaged, replace the flywheel.
13. Perform the following steps:
    a. Place the transmission in high gear. Lightly coat the input shaft splines with high temperature grease.
    b. Raise the transmission into position.
    c. On transmissions with a separate clutch housing, install the guide pins in the top 2 bolt holes if they have been removed.
    d. Roll the transmission forward and engage the clutch splines. Keep pushing the transmission forward until it mates with the engine.
    e. On transmissions with a separate clutch housing, remove the guide pins and install the bolts, tighten the bolts to 23 ft. lbs. (31 Nm).
    f. On the NV 3500, install the transmission-to-engine bolts. Tighten the bolts to 35 ft. lbs. (47 Nm)
14. When satisfied that the transmission is properly seated, install and tighten the transmission-to-engine bolts and/or studs to 34 ft. lbs. (47 Nm).
15. Install or connect the following:
    - Wiring, clips, tubes and brackets etc
    - Shifter cable
    - Starter
    - Exhaust pipes
    - Transmission crossmember. Torque the bolts to 56 ft. lbs. (77 Nm).
    - Transmission mount on the transmission. Torque the bolts to 35 ft. lbs. (47 Nm).
    - Nut and washer that secure the transmission mount to the crossmember. Torque the nut to 38 ft. lbs. (52 Nm).
    - Transmission to engine brace(s) Torque the bolts to 41 ft. lbs. (55 Nm) for gasoline engines and to 51 ft. lbs. (70 Nm) for diesel engines.
    - Transfer case, if equipped
16. Remove the transmission jack and engine support stands.
    - Driveshaft
    - Shifter lever and boot
    - Negative battery cable
17. Refill the transmission with fluid.
18. Road test the vehicle and test for proper operation. Check for leaks.

Automatic Transmission

AVALANCHE, SIERRA AND SILVERADO—4L60E/4L65-E

1. Remove or disconnect the following:
    - Transmission fluid
    - Transmission oil level indicator tube and seal from the transmission

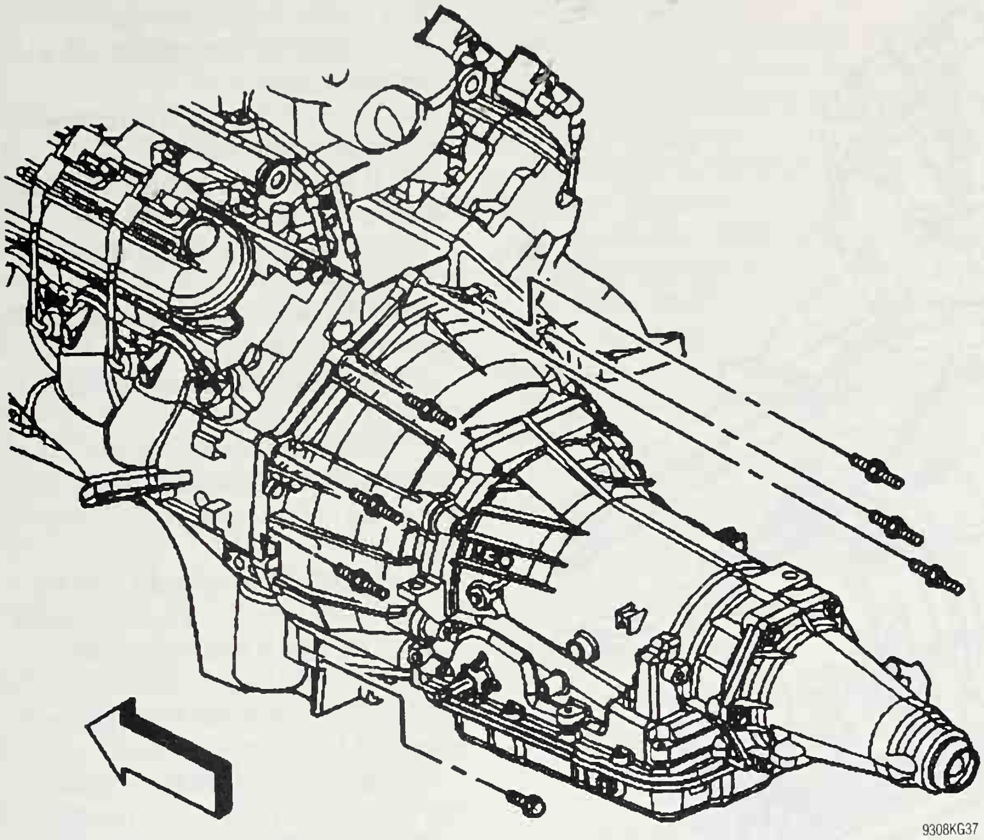
➡Plug the oil level indicator tube opening in the transmission.

- Shift cable end from the transmission shift lever ball stud
- Front propeller shaft, if 4WD
- Rear propeller shaft.

2. Plug the transmission oil cooler line connectors in the transmission case.
3. Remove or disconnect the following:
    - Starter motor
4. Support the transmission with a transmission jack.
5. Remove or disconnect the following:
    - Torque converter access plug
    - Flywheel-to-torque converter bolts
    - Transmission rear mount-to-transmission bolts and nut
    - Heat shield-to-transmission bolts
    - Transmission vent hose from the transmission
    - Fuel lines from the transmission
    - Wiring harness from the transmission
    - Transmission-to-engine stud and bolt
    - Six studs and bolt securing the transmission to the engine.
6. Install tool J21366 onto the transmission bell housing to retain the torque converter. Pull the transmission straight back.
7. The transmission from the vehicle
8. Flush the transmission oil cooler and cooling lines.

To install:

9. Install Tool J21366 onto the transmission bell housing to retain the torque converter.
10. Support the transmission with a transmission jack.
11. Raise the transmission into place and remove the tool from the transmission.
12. Slide the transmission straight onto the locating pins while lining up the marks on the flywheel and the torque converter. The torque converter must be flush onto the flywheel and rotate freely by hand.



4L60E removal—Silverado shown

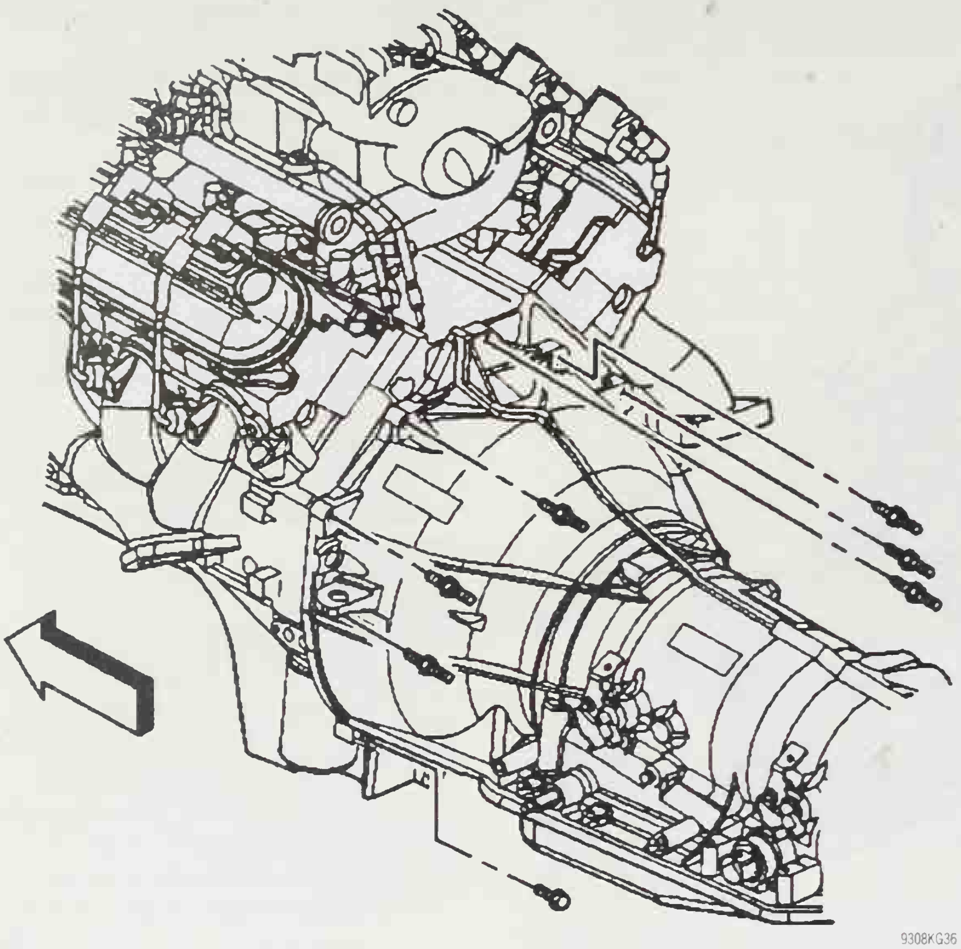
13. Install or connect the following:
    - Studs and bolt securing the transmission to the engine. Tighten to 37 ft. lbs. (50 Nm).
    - Flywheel to torque converter bolts
    - Torque converter access plug
    - Transmission vent hose to the transmission
    - Fuel lines to the transmission
    - Wiring harness to the transmission.
    - Heat shield-to-transmission bolts and tighten to 13 ft. lbs. (17 Nm)
    - Transmission rear mount-to-transmission bolt and nut and tighten to 18 ft. lbs. (25 Nm)
14. Remove the transmission jack from the transmission.
15. Unplug the transmission oil cooler line connectors in the transmission case.
16. Install or connect the following:
    - Transmission oil cooler lines
    - Front propeller shaft, if equipped
    - Rear propeller shaft
    - Shift cable end to the transmission shift lever ball stud
17. Unplug the oil level indicator tube opening in the transmission.
18. Install the transmission oil level indicator tube and seal to the transmission.
19. Tighten the oil pan bolts and fill the transmission with transmission fluid.
20. Lower the vehicle.

AVALANCHE, SIERRA AND SILVERADO—4L80E/4L85-E

1. Remove or disconnect the following:
    - Transmission fluid
    - Transmission oil level indicator tube and seal from the transmission
2. Plug the oil level indicator tube opening in the transmission.
    - Shift cable from the transmission shift lever ball stud
    - Front propeller shaft, if 4WD
    - Rear propeller shaft.
    - Transmission oil cooler lines, then plug thee openings in the transmission case
    - Starter motor
3. Support the transmission with a transmission jack.
    - Heat shield
    - Transmission vent hose
    - Fuel lines from the transmission
    - Wiring harness from the transmission
    - Transmission brace-to-engine bracket and transmission nut and bolt
    - Torque converter cover
    - Flywheel to torque converter bolts
    - Transmission rear mount
    - Stud and bolt on the right side securing the transmission to the engine
    - Remaining six studs and the bolt securing the transmission to the engine
4. Install Tool J21366 onto the transmission bell housing to retain the torque converter.
5. Pull the transmission straight back. Remove the transmission from the vehicle.
6. Flush the transmission oil cooler and cooling lines when you remove the transmission.

To install:

7. Install Tool J21366 onto the transmission bell housing to retain the torque converter.
8. Support the transmission with a transmission jack.
9. Raise the transmission into place and remove the tool from the transmission.
10. Slide the transmission straight onto the locating pins while lining up the marks on the flywheel and the torque converter. The torque converter must be flush onto the flywheel and rotate freely by hand.
11. Install or connect the following:
    - Six studs and bolt securing the transmission to the engine. Tighten to 37 ft. lbs. (50 Nm).
    - Stud and bolt on the right side securing the transmission to the engine. Tighten to 37 ft. lbs. (50 Nm).
    - Flywheel-to-torque converter bolts and tighten to 44 ft. lbs. (60 Nm).
    - Torque converter cover-to-engine bolts and tighten to 37 ft. lbs. (50 Nm)
    - Torque converter cover-to-transmission stud and bolt and tighten to 24 ft. lbs. (33 Nm).
    - Transmission vent hose
    - Fuel lines
    - Wiring harness
    - Heat shield. Tighten the bolts to 13 ft. lbs. (17 Nm).
    - Transmission rear mount-to-transmission nuts and bolt. Tighten to 18 ft. lbs. (25 Nm).
    - Transmission brace. Tighten the bolts and nut to 37 ft. lbs. (50 Nm).
12. Remove the transmission jack from the transmission.
    - Starter motor
13. Unplug the transmission oil cooler line connectors in the transmission case.
14. Connect the transmission oil cooler lines to the transmission.
15. Install or connect the following:
    - Rear propeller shaft
    - Front propeller shaft, if 4WD



4L80E removal—Silverado shown

- Shift cable end to the transmission shift lever ball stud

16. Unplug the oil level indicator tube opening in the transmission.

17. Install the transmission oil level indicator tube and seal to the transmission.

18. Tighten the oil pan bolts and fill the transmission with transmission fluid.

19. Lower the vehicle.

SIERRA AND SILVERADO—ALLISON

1. Drain the transmission.

2. Disconnect both negative battery cables.

3. Remove the transmission fluid level indicator.

4. Remove the right front wheel and tire.

5. Remove the right front wheel house inner panel retainers.

6. Disconnect any harness retainers attached to the inner panel.

7. Remove the inner panel.

8. Remove the starter.

9. Remove the engine protection shield bolts and shield.

10. Rotate the engine clockwise, using the crankshaft bolt in order to access the torque converter bolts thru the starter opening. Have an assistant rotate the engine while aligning the bolts.

11. Remove the torque converter bolts.

12. Completely raise the vehicle.

13. Disconnect the shift cable from the selector lever ball stud and remove the cable from the bracket.

14. Remove the shift cable bracket bolts and bracket from the transmission.

15. Reposition the bracket with the cable attached off to the side.

16. Remove the fuel line retainer bolts on the left side of the transmission.

17. Remove the fuel line bracket nut from the converter housing stud.

18. Disconnect the turbine speed sensor and input speed sensor electrical connectors.

19. Disconnect the output speed sensor electrical connector.

20. If the vehicle is equipped with 4 wheel drive (4WD), the output speed sensor is located on the transfer case and will be disconnected later.

21. Disconnect the transmission main electrical connector.

22. Disconnect the park/neutral position (PNP) switch electrical connector.

23. Remove the exhaust hanger bolts and reposition the hanger.

24. If the vehicle is a 2 wheel drive (2WD), remove the propeller shaft.

25. Support the transmission with a transmission jack.

26. If the vehicle is a 2WD, remove the transmission mount nuts.

27. If the vehicle is a 2WD, remove the transmission support bolts and nuts.

28. Remove the transmission mount bolts and mount.

29. If the vehicle is equipped with 4WD, remove the transfer case.

30. Reposition any wiring harness branches out of the way.

31. Secure a safety chain around the transmission. Use care not to overlap any wiring, fuel lines, or other related components.

32. Disconnect and plug the transmission oil cooler lines from the transmission.

33. If the vehicle is equipped with a power take off (PTO) unit , disconnect and/or remove any necessary components to facilitate transmission removal.

34. Remove the transmission fill tube nuts from the converter housing studs.

35. Remove the wire harness/vent tube bracket nut from the converter housing stud and reposition the bracket.

36. Remove the remaining converter housing bolts and studs.

37. Separate the transmission from the engine.

38. Install torque converter holding tool J-21366 to the converter housing in order to keep the torque converter from sliding off of the turbine shaft.

39. Carefully lower the transmission from the vehicle while simultaneously removing the fill tube.

40. Remove the holding tool.

To install:

41. Install torque converter holding tool J-21366 to the converter housing in order to keep the torque converter from sliding off of the turbine shaft.

42. Raise the transmission into place while simultaneously installing the transmission fill tube.

43. Remove the holding tool.

44. Align the transmission with the engine using the alignment dowels located at the rear of the engine.

➡Ensure that the torque converter can be rotated before tightening the bolts and studs.

45. Install the converter housing bolts and studs and tighten to 37 ft. lbs. (50 Nm).

46. Install the wire harness/vent tube bracket and nut to the converter housing stud.

47. Install the transmission fill tube and nuts to the converter housing studs.
48. If the vehicle is equipped with a PTO unit, connect and/or install the components at this time.
49. Remove the safety chain from around the transmission.
50. Install the transfer case, if the vehicle is equipped with 4WD.
51. If the vehicle is a 2WD, install the transmission mount and tighten to 37 ft. lbs. (50 Nm).
52. Install the transmission support and tighten to 70 ft. lbs. (95 Nm).
53. If the vehicle is a 2WD, install the transmission mount nuts and tighten to 30 ft. lbs. (40 Nm).
54. Remove the transmission jack.
55. If the vehicle is a 2WD, install the propeller shaft.
56. Position the exhaust hanger and install the bolts.
57. Position the wiring harness branches.
58. Connect the PNP switch electrical connectors.
59. Connect the transmission main electrical connector
60. Connect the output speed sensor electrical connector. If the vehicle is equipped with 4WD, the output speed sensor is located on the transfer case and has been connected during the transfer case installation.
61. Connect the turbine speed sensor and the input speed sensor electrical connectors.
62. Install the fuel line bracket and nut to the transmission converter housing stud.
63. Install the fuel line retainer and bolts to the left side of the transmission.
64. Install the shift cable bracket and bolts to the transmission.
65. Install the shift cable to the bracket and the selector lever ball stud.
66. Remove the access hole cover on the converter housing in order to rotate the converter and align the first torque converter bolt. If reusing the torque converter bolts, clean the bolt threads and apply Loctite® or equivalent to the threads prior to installation.
67. Install the torque converter bolts and tighten to 44 ft. lbs. (760 Nm).
68. Install the converter housing access hole cover.
69. Install the engine protection shield and bolts.
70. Position and install the starter.
71. Install the inner panel.
72. Connect any harness retainers to the inner panel.
73. Install the right front wheel house inner panel retainers.
74. Install the right front wheel and tire.
75. Remove the plugs from the transmission oil cooler line fittings in the transmission case, if necessary.
76. Flush the transmission oil cooler and lines, if necessary.
77. Connect the transmission oil cooler lines to the transmission.
78. Lower the vehicle.
79. Connect both negative battery cables.
80. Fill the transmission with new transmission fluid.
81. Install the transmission fluid level indicator.
82. If a replacement transmission was installed, perform the Fast Learn procedure using a scan tool.

EXPRESS AND SAVANA

1. Drain the transmission.
2. Remove or disconnect the following:
    - Negative battery cable
    - Shift cable, control lever and bracket
    - Exhaust pipes
    - Parking brake cables
    - Driveshaft, matchmark for reassembly
    - Transfer case, if equipped
    - Transmission to engine braces (vehicles equipped with diesel engines have only 1 brace)
    - Wiring harness at the transmission
3. Support the transmission with a transmission jack.
    - Nut securing the transmission mount to the crossmember
4. Position a transmission jack or equivalent, under the transmission for support.
    - Crossmember. Visually inspect to see if other equipment, brackets or lines, must be removed to permit removal of transmission.

➡Mark position of crossmember when removing to prevent incorrect installation. The tapered surface should face the rear.

5. Perform the following:
    a. Remove the torque converter inspection cover.
    b. Mark the alignment of the torque converter to the flexplate.
    c. Remove the torque converter to flexplate bolts. Remove the dipstick tube and seal from the transmission. Plug the opening to avoid contamination.
    d. Disconnect both transmission lines at the transmission and plug them to avoid contamination and leakage.
    e. Position a J 21366 converter holding strap onto the transmission/torque converter to keep the torque converter from sliding off of the transmission turbine shaft.

➡The use of guide pins will not only support the transmission but will prevent damage to the clutch disc. Guide pins can be made by using 2 bolts, the same as those just removed only longer, and cutting off the heads. Make an adjustment slot.

6. Remove the remaining bolts and slide transmission straight back from engine. Use care to keep the transmission drive gear straight in line with clutch disc hub.
7. Remove or disconnect the following:
    - Wiring, clips, tubes and brackets etc., which would interfere with the removal of the transmission

➡Ensure that the engine is supported with a jack stand before detaching the transmission from the engine.

    - Transmission from the engine
8. Carefully lower the transmission using the transmission jack.

To install:

9. Check the area behind the torque converter for leaks. Replace the front seal, if required.
10. It is good practice to examine the area around the rear crankshaft seal, checking for leaks. If necessary, remove the flexplate and replace the seal.
11. Inspect the flexplate ring gear teeth. If damaged, replace the flexplate.
12. Perform the following steps:
    a. With tool J 21366 or equivalent, torque converter holding strap in place, raise the transmission into position with a transmission jack.
    b. Remove the torque converter holding strap and slide the transmission into place. Slide the transmission straight onto the locating pins while lining up the marks on the flexplate and the torque converter. Be sure the transmission is fully seated against the rear of the engine block and the locating pins are completely engaged.

⁂ WARNING

DO NOT attempt to draw the transmission to the block with the mounting bolts. If the transmission is not properly seated, the bolts will break the transmission case.

➡The torque converter must be flush with the flexplate and rotate freely by hand.

13. When satisfied that the transmission is properly seated, install and tighten the transmission-to-engine bolts and/or studs to 34 ft. lbs. (47 Nm).

14. Perform the following steps:

a. Install the dipstick tube and seal.

b. Check the alignment marks on the torque converter and flexplate to be sure that they are properly aligned. Install the torque converter bolts. Finger-tighten the bolts to ensure proper converter seating. When the converter is properly seated, tighten the bolts to 46 ft. lbs. (63 Nm).

c. Install the torque converter cover. Tighten the retaining bolts to 24 ft. lbs. (33 Nm) on the 4.3L engines or 89 inch lbs. (10 Nm) on the V8 engines.

15. Install or connect the following:

- Wiring, clips, tubes and brackets etc
- Transmission cooling lines
- Shifter cable
- Starter
- Exhaust pipes
- Transmission crossmember. Torque the bolts to 56 ft. lbs. (77 Nm).
- Transmission mount on the transmission. Torque the bolts to 35 ft. lbs. (47 Nm).
- Nut and washer that secure the transmission mount to the crossmember. Torque the nut to 38 ft. lbs. (52 Nm).
- Transmission to engine brace(s) Torque the bolts to 41 ft. lbs. (55 Nm) for gasoline engines and to 51 ft. lbs. (70 Nm) for diesel engines.
- Transfer case, if equipped

16. Remove the transmission jack and engine support stands.

- Driveshaft
- Shifter lever and boot, on manual transmissions
- Negative battery cable

17. Refill the transmission with fluid.

18. Road test the vehicle and test for proper operation. Check for leaks.

Clutch

ADJUSTMENTS

The hydraulic clutch system requires no periodic adjustment.

REMOVAL & INSTALLATION

1. Remove or disconnect the following:
   - Transmission
   - Quick disconnect from the actuator cylinder
2. Install a clutch alignment tool.
3. Mark the flywheel and a clutch pressure plate lug for the installation alignment.
4. Remove the pressure plate bolts and the washers.
5. Secure the clutch pressure plate and the clutch driven plate to the flywheel.
6. Remove the clutch alignment tool.

To install:

7. Install the bolts and the washers securing the clutch pressure plate and the clutch driven plate to the flywheel.
8. Install the clutch alignment tool.
9. Align the marks made during removal or, if new align the lightest part of the clutch pressure plate identified by a yellow dot, to the heaviest part of the flywheel, identified by an "X". Tighten the clutch pressure plate to the flywheel bolts to 52 ft. lbs. (70 Nm) in a crisscross pattern.
10. Remove the clutch alignment tool.
11. Install the transmission.
12. Install the quick disconnect to the concentric slave cylinder.

Hydraulic Clutch System

BLEEDING

Bleeding air from the hydraulic clutch system is necessary whenever any part of the system has been disconnected or the fluid level (in the reservoir) has been allowed to fall so low, that air has been drawn into the master cylinder.

1. Fill master cylinder reservoir with new brake fluid conforming to DOT 3 specifications.
2. Have an assistant fully depress and hold the clutch pedal, then open the bleeder screw.
3. Close the bleeder screw and have your assistant release the clutch pedal.
4. Repeat the procedure until all of the air is evacuated from the system. Check and refill master cylinder reservoir as required to prevent air from being drawn through the master cylinder.

➡Never release a depressed clutch pedal with the bleeder screw open or air will be drawn into the system.

5. Test the clutch for proper operation.

Transfer Case Assembly

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Remove or disconnect the following:
   - Transfer case shields
   - Front propeller shaft
   - Rear propeller shaft
   - Shift rod from the transfer case
   - Vent hose from the transfer case
   - Vehicle Speed Sensor (VSS) electrical connectors
   - All necessary wiring harnesses from the transfer case
2. Support the transfer case with a transmission jack.
3. If equipped with a NV3500 manual transmission, remove or disconnect the following:
   - Bolt securing the left side support brace to the transmission
   - Bolt and stud securing the left side support brace to the transfer case
   - Two bolts securing the right side support brace to the transmission and transfer case
4. Remove or disconnect the following:
   - Six nuts securing the transfer case and bracket to the transmission or transmission adapter, as applicable
   - Transfer case
   - Gasket, then discard

To install:

5. Install a new gasket to the transmission. Use Teflon pipe sealant GM P/N 12346004 in order to hold the gasket in place.
6. Raise and position the transfer case to the vehicle.
7. Install or connect the following:
   - Six nuts securing the transfer case and bracket to the transmission adapter or transmission. Tighten to 37 ft. lbs. (50 Nm).
8. If equipped with a manual transmission, install or connect the following:
   - Bolt securing the left side support brace to the transmission and tighten to 37 ft. lbs. (50 Nm)
   - Bolt and stud securing the left side support brace to the transfer case and tighten to 37 ft. lbs. (50 Nm)
   - Two bolts securing the right side support brace to the transmission and transfer case and tighten to 37 ft. lbs. (50 Nm)
9. Install or connect the following:
   - Vent hose to the transfer case
10. Check the transfer case oil level.

11. VSS electrical connectors
    - Wiring harness to the transfer case
    - Shift rod to the transfer case
    - Front and rear propeller shafts
    - Transfer case shields
12. Lower the vehicle.

Express and Savana

1. Drain transfer case of lubricant.
2. Remove or disconnect the following:
    - Negative battery cable
    - Skid plate, if equipped
    - Vent hose clamp at the transfer case
    - Front driveshaft at the transfer case and support it aside
    - Rear driveshaft and support it aside
    - Electrical connections from the transfer case
    - Transfer case shift linkage
3. Support the transfer case with a transmission jack.
    - Transmission-to-transfer case bolts and spring washers
    - Transfer case assembly and gasket
4. Carefully lower the transfer case.

To install:

5. Carefully raise the transfer case into position.
6. Install or connect the following:
    - New gasket to the transmission, using gasket sealer to hold it in place
    - Transfer case onto the transmission or transmission adapter. Torque the bolts to 33 ft. lbs. (45 Nm).
    - Electrical harness connectors to the transfer case connections
    - Transfer case shift linkage and make the proper adjustments
    - Front and rear driveshafts
7. Refill the transfer case with DEXRON IIE automatic transmission fluid.
    - Skid plate, if equipped
    - Negative battery cable
8. Test drive for proper operation.

Halfshaft

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Remove or disconnect the following:
    - Wheels
2. Insert a drift or a large screwdriver through the brake caliper into one of the brake rotor vanes in order to prevent the drive axle wheel drive shaft from turning.
3. Remove or disconnect the following:
    - Nut and the washer from the hub

➡Do not reuse the hub nut. A new nut must be used when installing the wheel drive shaft.

- Bolts (6) securing the wheel drive shaft inboard flange to the output shaft flange
- Drift from the rotor
- Stabilizer shaft link from the lower control arm

4. Wrap shop towels around both the inner and the outer wheel drive shaft boots in order to avoid damage to the boots during removal and installation.
5. Pull the wheel drive shaft through the lower control arm opening.

To install:

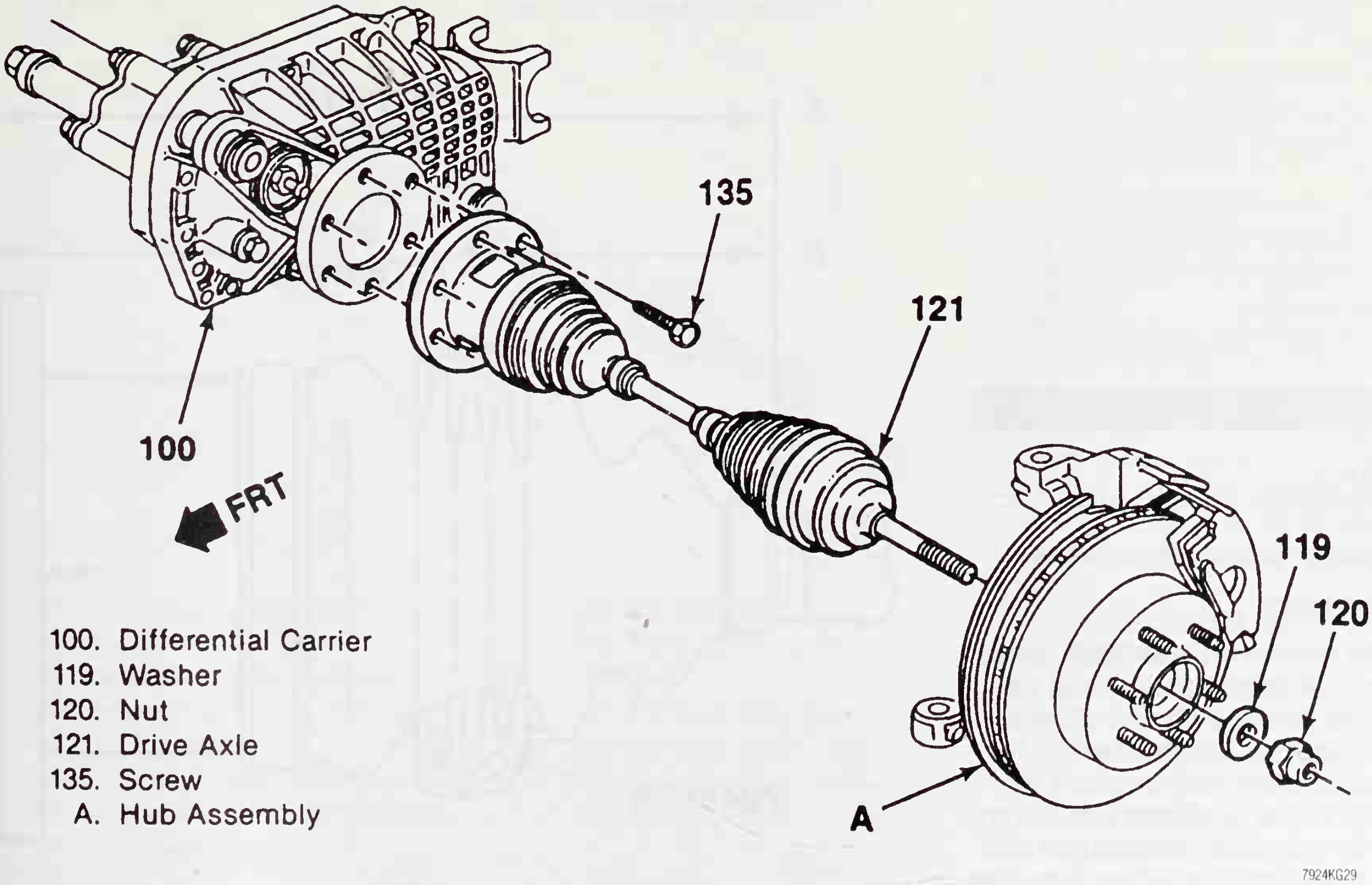
6. Wrap shop towels around both the inner and the outer wheel drive shaft boots in order to avoid damage to the boots during removal and installation.

➡Clean the steering knuckle and the wheel drive shaft splines and threads. These areas must be dry and free of grease, dirt, and contamination.

7. Insert the wheel drive shaft splined shank into the knuckle hub.

➡Use only a genuine GM front wheel drive shaft nut. Installation of anything but an OEM front wheel drive shaft nut could cause damage to the vehicle.

8. Install or connect the following:
    - Washer and the new hub nut to the wheel driveshaft. Do not tighten.



The halfshaft is mounted to the flange on the differential and through the hub assembly—4-wheel drive models

- The wheel drive shaft inboard flange to the output shaft flange using the inboard flange bolts

9. Insert a drift or a large screwdriver through the brake caliper into 1 of the brake rotor vanes in order to prevent the wheel drive shaft from turning. Tighten the inboard flange bolts to 58 ft. lbs. (78 Nm). Tighten the hub nut to 177 ft. lbs. (240 Nm).
10. Remove the drift from the rotor.
11. Install the stabilizer shaft link.
12. Install the wheel and tire assembly.

Express and Savana

1. Remove the front wheel and tire assembly.
2. Remove the halfshaft nut.
3. Remove the halfshaft retaining bolts.
4. Remove the left and/or right ha;fshaft from the front differential flange.
5. Install axle remover tool J-45859 to the wheel hub.
6. Use the tool to remove the halfshaft from the steering knuckle.
7. Remove the left and/or right halfshaft

To install:

8. Install the right halfshaft in the steering knuckle.
9. Install the right halfshaft to the differential flange.
10. Clean the threads of the bolts with denatured alcohol or equivalent and allow to dry.
11. Apply Threadlocker to the threads of the bolt.
12. Install the retaining bolts for the right halfshaft and tighten to 58 ft. lbs. (79 Nm).
13. Repeat the procedure for the left halfshaft.
14. Install the wheel drive shaft retaining nuts and tighten to 155 ft. lbs. (210 Nm).
15. Inspect the fluid level of the front differential assembly.
16. Install the tires and wheels.

CV-Joints

OVERHAUL

Avalanche, Sierra and Silverado

INNER JOINT

➡With removal of the halfshaft for any reason, the transmission sealing surface (the tripot male/female shank of the halfshaft) should be inspected for corrosion. If corrosion is evident, the surface should be cleaned with 320 grit cloth or equivalent. Transmission fluid may be used to clean off any remaining debris. The surface should be wiped dry and the halfshaft reinstalled free of any buildup.

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Use a hand grinder in order to cut through the swage ring.
3. Remove the tripot housing from the halfshaft. Wipe the grease off of the tripot assembly roller bearings and the tripot housing. Thoroughly degrease the tripot housing. Allow the tripot housing to dry prior to assembly.

➡Handle the tripot spider assembly with care. Tripot balls and needle rollers may separate from the spider trunnion if the tripot balls and needle rollers are not handled carefully.

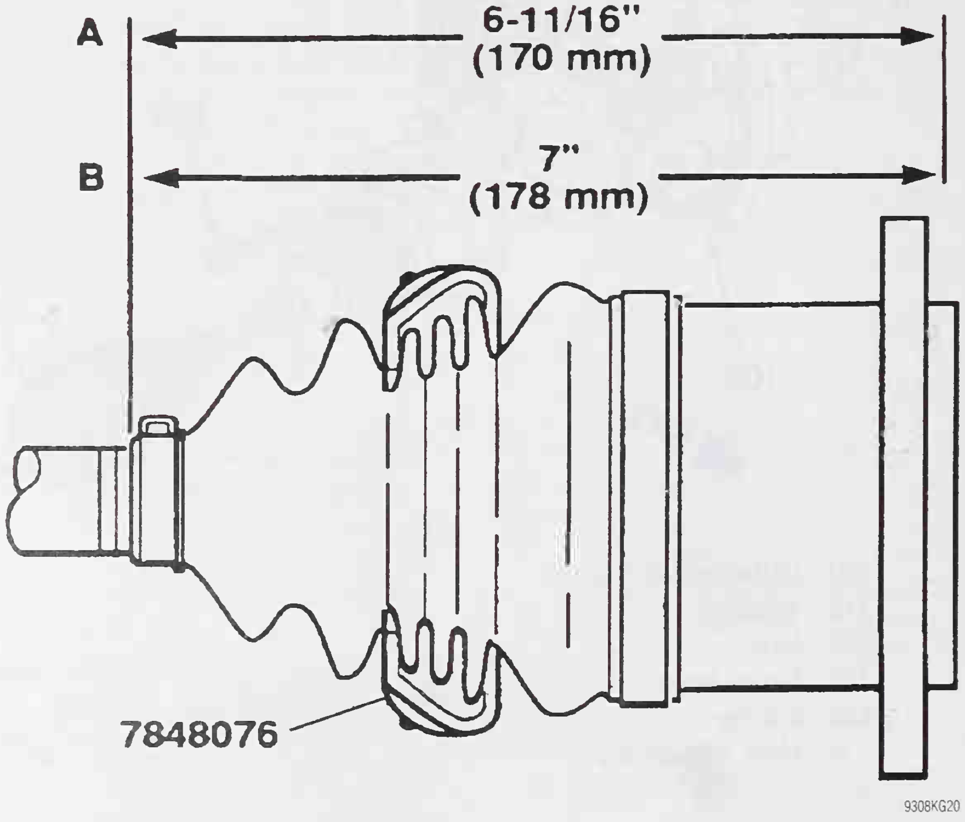
4. Use side cutters to cut away the small boot clamp.
5. Compress the tripot boot up the halfshaft away from the tripot spider assembly toward the outboard (CV joint assembly) end of the halfshaft.
6. Spread the spider spacer ring with tool J8059, or equivalent.
7. Remove the following items from the halfshaft bar:
    a. The spacer ring.
    b. The spider assembly.
    c. The tripot boot.
8. Clean the halfshaft bar. Use a wire brush in order to remove any rust in the boot mounting area (grooves).
9. Inspect the needle rollers, needle bearings, and trunnion. Check the tripot housing for unusual wear, cracks, or other damage. Replace any damaged parts.

To assemble:

10. Place the new small boot clamp onto the small end of the joint boot.
11. Compress the joint boot and small boot clamp onto the halfshaft bar.
12. Position the small end of the joint boot into the joint boot groove on the halfshaft bar.
13. Secure the small boot clamp with tool J35910, or equivalent, a breaker bar, and a torque wrench. Tighten the small boot clamp (1) to 100 ft. lbs. (136 Nm).
14. Check the gap dimension on the clamp ear. Continue tightening until the gap dimension is reached.

➡Assemble the CV joint with the convolute retainer in the correct position, as illustrated.

15. Install the convolute retainer over the inboard joint boot, being sure to capture three convolutions.
16. Install the tripot spider assembly onto the halfshaft bar with the counterbore towards the end of the halfshaft bar.
17. Install the spacer ring in the groove at the end of the halfshaft bar.
18. Push the spider assembly back



Assembled joint measurement—15 Series Pickups toward the end of the halfshaft bar until the spacer ring is covered by the spider assembly counterbore.

19. Pack the tripot boot and the tripot housing with the grease supplied in the kit. The amount of grease supplied in this kit has been pre-measured for this application.

20. Reassemble the tripot housing and the tripot boot using the following procedure:

a. Pinch the swage ring slightly by hand in order to distort it into an oval shape.

b. Slide the distorted swage ring over the large diameter of the boot.

c. Place the tripot housing over the spider assembly.

d. Install the boot onto the tripot housing.

e. Align the tripot boot with the swage ring in place, over the flat area on the tripot housing.

21. Mount tool J36652 in a vise. Install the bottom half of the split-plate swage clamp. For K15 models, use tool J36652-98. For K25 models, use tool J36652-1.

22. Check the inboard stroke position. Use measurement A for the K15 models. Use measurement B for the K25 models.

23. Position the inboard end (tripot end) of the halfshaft assembly in tool J36652. Install the top half of the proper size tool on the lower half of the tool. For K15 models, use tool J36652-98. For K25models, use tool J36652-1.

24. Align the swage ring and the swage ring clamp. Insert the bolts. Hand tighten the bolts in tool J36652 until the bolts are snug.

25. Align the following during this procedure:

a. The tripot boot.

b. The housing.

c. The swage ring. Tighten each bolt 180 degrees at a time. Alternate between the bolts until both sides of the top half of J36652 touch the bottom half of the tool.

26. Loosen the bolts and remove the halfshaft assembly from J36652.

27. Remove the convolute retainer from the boot.

OUTER JOINT

1. Place protective covers over the vise jaws. Place the halfshaft in the vise.

2. Use a hand grinder to cut through the swage ring. Use side cutters to cut off the small boot clamp.

3. Slide the boot down the halfshaft bar and away from the CV-joint outer race. Wipe all grease away from the face of the CV joint.

4. Find the halfshaft bar retaining snap ring, which is located in the inner race.

5. Spread the snapring ears apart.

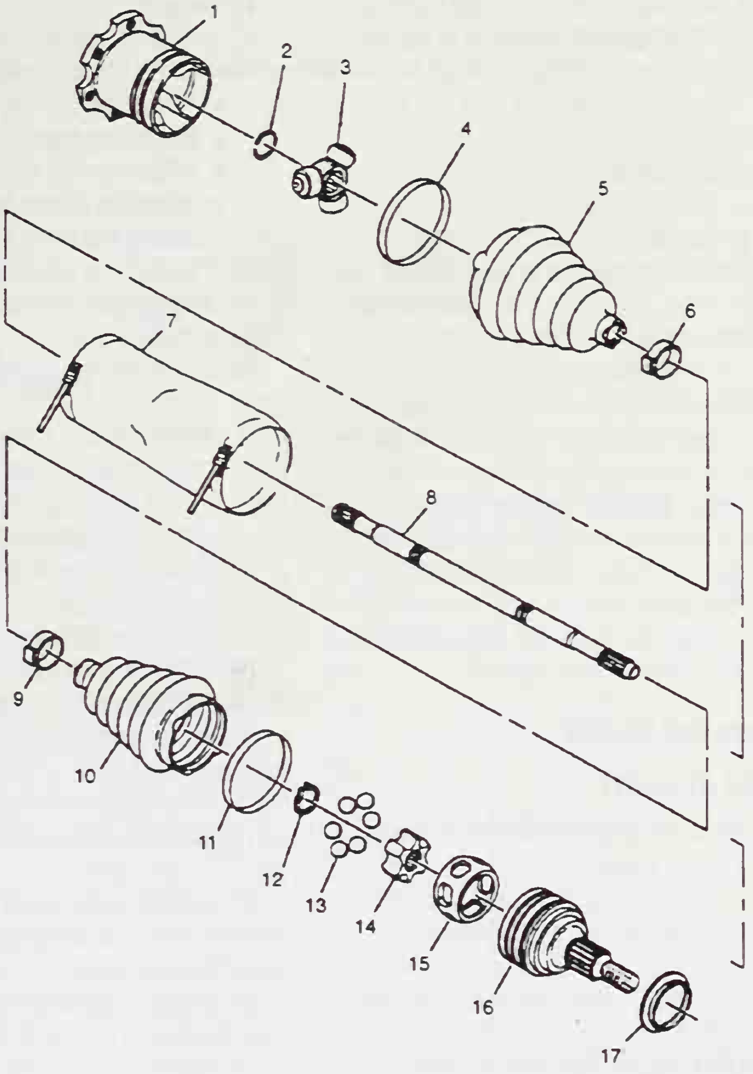
6. Pull the CV joint and the CV joint boot from the halfshaft bar. Discard the old CV joint boot.

7. Place a brass drift against the CV joint cage. Tap gently on the brass drift with a hammer in order to tilt the cage.

8. Remove the first chrome alloy ball when the CV joint cage tilts. Tilt the CV joint cage (1) in the opposite direction to remove the opposing chrome alloy ball. Repeat this process to remove all six of the balls.

9. Pivot the CV joint cage and the inner race 90 degrees to the center line of the outer race. At the same time, align the cage windows with the lands of the outer race. Lift out the cage and the inner race.

10. Remove the inner race from the cage by rotating the inner race upward. Clean the following items thoroughly with cleaning solvent. Remove all traces of old grease and any contaminates.



Legend

(1) Tripot Housing Assembly
(2) Spacer Ring
(3) Tripot Joint Spider Assembly
(4) Swage Ring
(5) Tripot Joint Seal
(6) Small Seal Retaining Clamp
(7) Drive Axle Seal Cover (Optional)
(8) Drive Axle Shaft
(9) CV Joint Seal
(10) Race Retaining Ring
(11) Ball
(12) CV Joint Inner Race
(13) CV Joint Cage
(14) CV Joint Outer Race
(15) Deflector Ring

Exploded view of the CV-Joint assembly

a. Inner and outer race assemblies.
b. CV joint cage.
c. Chrome alloy balls.

11. Dry all the parts. Check the CV joint assembly for unusual wear, cracks, or other damage. Replace any damaged parts. Clean the halfshaft bar. Use a wire brush to remove any rust in the boot mounting area (grooves).

To assemble:

12. Inspect all of the parts for unusual wear, cracks, or other damage. Replace the CV joint assembly if necessary. Put a light coat of the recommended grease on the inner and the outer race grooves.

13. Hold the inner race at 90 degrees to the centerline of the cage. Align the lands of the inner race with the windows of the cage. Insert the inner race into the cage by rotating the inner race downward.

14. Insert the cage and inner race into the outer race.

15. Place a brass drift against the CV joint cage. Tap gently on the brass drift with a hammer in order to tilt the cage. Install the first chrome alloy ball when the CV joint cage tilts. Tilt the CV joint cage in the opposite direction to install the opposing chrome alloy ball. Repeat this process in order to install all six of the balls.

16. Pack the CV joint boot and the CV joint assembly with the grease supplied in the kit. The amount of grease supplied in this kit has been pre-measured for this application.

17. Place the new small boot clamp onto the CV joint boot.

18. Slide the CV joint boot onto the halfshaft bar.

19. Position the small end of the CV joint boot into the joint boot groove on the halfshaft bar.

20. Secure the small boot clamp, a breaker bar, and a torque wrench. Tighten the small clamp (1) to 100 ft. lbs. (136 Nm).

21. Check the gap dimension on the clamp ear. Continue tightening until the gap dimension is reached.

22. Pinch the new swage ring slightly by hand to distort it into an oval shape. Slide the distorted swage ring over the large diameter of the boot.

➡Be sure that the retaining ring side of the CV joint inner race faces the halfshaft bar (3) before installation.

23. Slide the CV joint onto the halfshaft bar. The retaining snap ring inside of the inner race engages in the halfshaft bar groove with a click when the CV joint is in the proper position.

24. Pull on the CV joint to verify engagement.

25. Slide the large diameter of the CV joint boot with the large swage ring in place, over the outside edge of the CV joint outer race.

26. Clamp the CV joint boot tightly to the CV joint outer race with the large swage ring, using the following procedure:

a. Mount tool J36652 in a vise.
b. Install the bottom half of the split-plate swage clamp. For K15 models, use tool J36652-98.
c. For K25 models, use tool J36652-1.
d. Position the CV joint end (outboard end) of the halfshaft assembly in the bottom half of tool J36652.

27. Align the following during this procedure:

a. CV joint boot.
b. CV joint assembly.
c. Swage ring.

28. Install the top half of tool J36652 onto the lower half of the tool, over the CV joint boot and the CV joint assembly.

29. Align the swage ring and the swage ring clamp.

30. Insert the bolts into J36652. Hand tighten the bolts until the bolts are snug. Tighten each bolt 180 degrees at a time. Alternate between the bolts until both sides of the top half of the tool touch the bottom half of the tool.

31. Loosen the bolts and remove the halfshaft assembly from the tool.

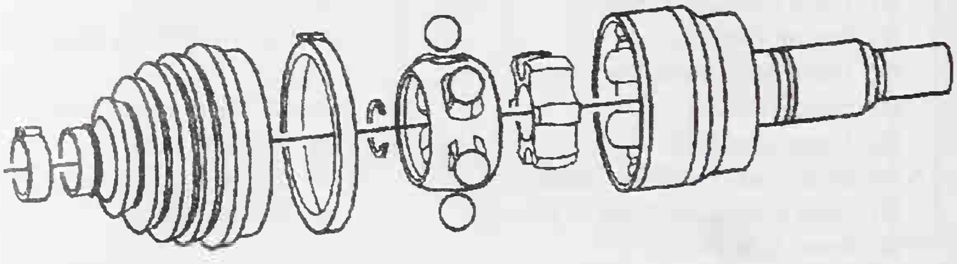
Express and Savana

OUTER CV-JOINT

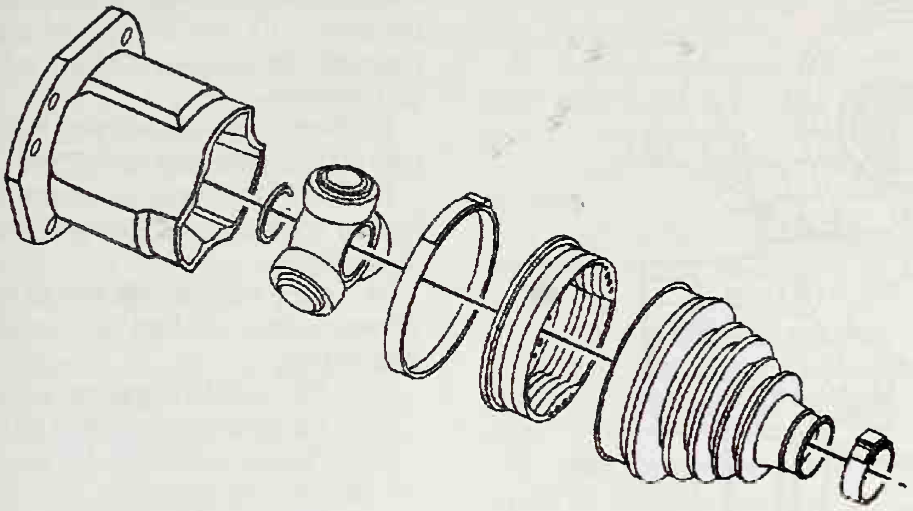
1. Remove or disconnect the following:
   - Front wheel
   - Halfshaft and position it in a vise
   - Large CV-joint boot clamp and discard it
   - Small CV-joint boot clamp and discard it
2. Separate the seal from the joint outer race at the large end.
3. Position the seal behind the joint face.
4. Wipe the grease from the face of the joint inner race, cage, balls, etc.
5. Remove the outer joint from the halfshaft bar.
6. Have an assistant hold the joint housing.
7. Position a wood block between the seal and the joint (along the joint face).
8. Strike the wood block with a hammer to compress the axle shaft retaining ring.
9. Continue to strike the wood block to remove the outer joint from the bar.
10. Remove the retaining ring from the bar.
11. Remove the seal from the bar.

To install:

12. Install or connect the following:
    - Small ring clamp on the CV boot
    - New retaining ring on the halfshaft
    - Large ring clamp on the CV boot
    - Retaining ring onto the bar
    - Insert the grease from the service kit into the outer joint
13. Position the outer joint horizontally.
14. Engage the inner race splines onto the axle shaft splines.
15. Compress the halfshaft retaining ring.
16. Press one end of the retaining ring, using a flat-bladed screwdriver or equivalent tool, into the bar groove while firmly pressing the outer joint onto the axle shaft.
17. Continue to work around the retaining ring until it is compressed.
18. Install the outer joint to the bar.
19. Position a wood block squarely over the end of the outer joint threaded shaft.
20. Use a hammer to drive the outer joint onto the bar.
21. Continue to drive the outer joint until you feel the outer joint seat fully onto the bar.
22. Inspect to be sure that the axle shaft and the inner race stepped surfaces are fully seated to each other.
23. Position the small end of the seal over the mating groove in the bar.
24. Compress the small clamp using crimping pliers until the crimp dimension is 0.02-0.06 in. (0.5-1.6 mm).



Exploded view of the outer CV-Joint assembly—Express and Savana



Exploded view of the inner CV-Joint assembly—Express and Savana

25. Vent the joint to relieve excess trapped air.

26. Compress the small clamp using crimping pliers until the crimp dimension is 0.02-0.06 in. (0.5-1.6 mm).

27. Install the halfshaft and the front wheel.

INNER (TRI-POT) JOINT

1. Remove the front wheel.
2. Remove the halfshaft and place it in a vise.
3. Remove the large clamp and the small clamp. Use a side cutter or other suitable tool and discard the clamps.
4. Remove the tripot housing.
5. Compress the tripot seal up the bar, away from the tripot spider assembly toward the outboard end of the halfshaft assembly.
6. Spread the spider snap ring with snap ring pliers.
7. Remove and discard the snap ring.
8. Remove the spider assembly.
9. Remove the tripot bushing.
10. Remove the tripot seal.
11. Clean the bar with a wire brush in order to remove any rust in the seal mounting areas.

To install:

12. Slide the new clamps (4, 7) on the tripot seal (6).
13. Install the tripot seal (6) over the wheel drive shaft.
14. Install the tripot bushing (5) into the seal.
15. Slide the spider assembly onto the wheel drive shaft.
16. Install the new spider snap ring (2) with snap ring pliers.
17. Install the tripot housing (1) over the spider assembly and seat it in the bushing.
18. Seat the small end of the tripot seal (6) into the groove on the wheel drive shaft.
19. Compress the small clamp using the, until the gap dimension is 0.02-0.06 in. (0.5-1.6mm).
20. Fill the joint and seal cavity with the grease supplied in the service kit.
21. Seat the large end of the tripot seal (6) into the groove on the tripot bushing.
22. Check the stroke position of the joint, and set it so the dimension (A) is 6.92 in. (176mm).
23. Vent the joint to relive excess trapped air.
24. Secure the large clamp using a crimper.
25. Install the halfshaft and the front wheel.

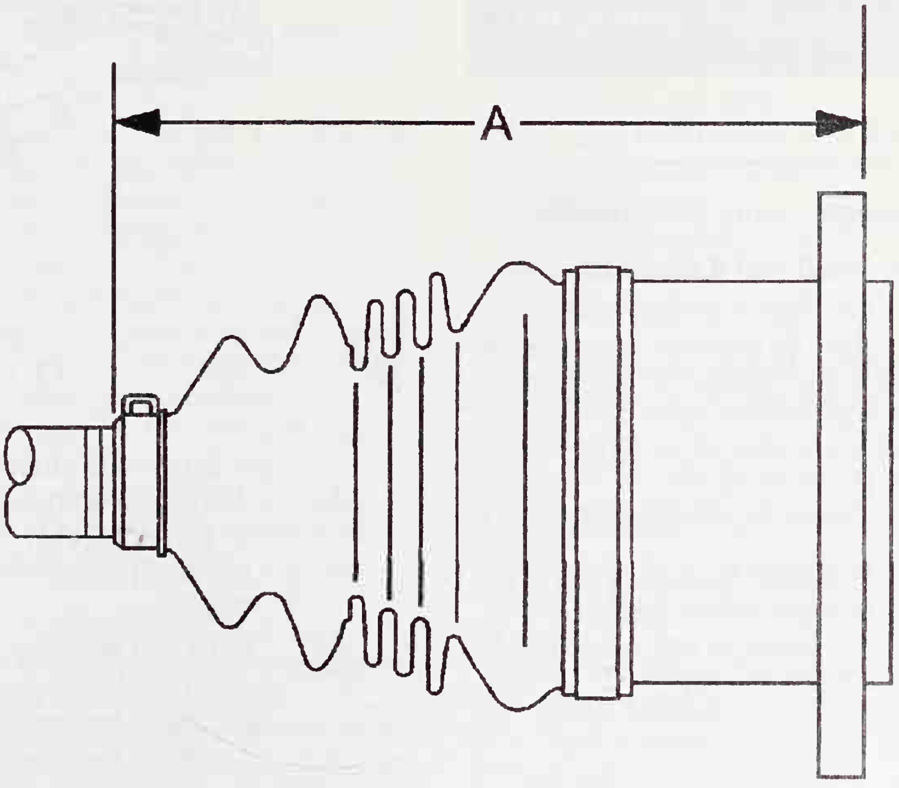
Transfer Case Encoder Motor

REMOVAL & INSTALLATION

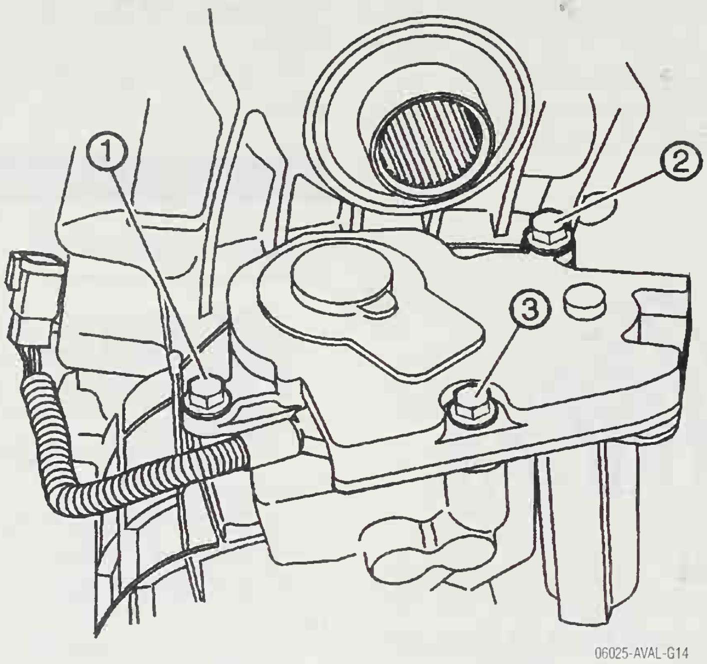
1. Remove the transfer case shield.
2. Remove the front propeller shaft.
3. Disconnect the transfer case switch electrical connector.
4. Disconnect the encoder motor electrical connector.
5. Remove the encoder motor bolts.
6. Remove the encoder motor.
7. Remove the actuator insulator gasket.
8. If replacing the encoder motor, remove the locating pins from the old motor.

To install:

➡If the encoder motor is being replaced because it is defective, ensure that the transfer case is in the neutral position. Manually shift the transfer case at the shift shaft, using a crescent wrench if necessary. When installing the encoder motor, ensure that the encoder motor is indexed correctly and the motor is flat against the transfer case before tightening the bolts.



Boot positioning dimension on inner joint—Express and Savana



Encoder motor tightening sequence

9. Install the locating pins to the new encoder motor.
10. Position a new actuator insulator gasket to the transfer case.
11. Install the encoder motor.
12. Install encoder motor bolts and tighten in sequence to 15 ft. lbs. (20 Nm).
13. Connect the encoder motor electrical connector.
14. Connect the transfer case switch electrical connector.
15. Install the front propeller shaft.
16. Install the transfer case shield.

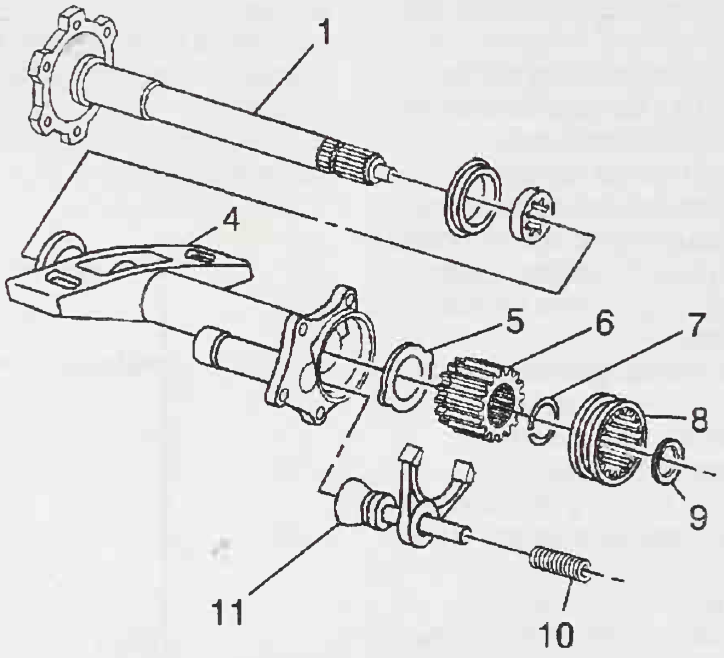
Front Axle Shaft, Bearing and Seal

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

8.25 S4WD AND 9.25 AXLES

1. Raise and support the vehicle.
2. Drain the differential carrier assembly.
3. If only replacing the right side inner shaft and/or housing, follow the steps below. If only replacing the left side inner shaft, proceed to step 19.
4. Remove the stabilizer shaft link assembly.
5. Disconnect the electrical connector from the electric motor actuator.
6. Disconnect the wire harness from the inner axle shaft housing.
7. Remove the drive shaft inboard flange bolts from the inner axle shaft.
8. Disconnect the wheel drive shaft from the inner axle shaft.
9. Remove the inner axle shaft housing nuts from the bracket.
10. For 25/35 series vehicles, remove the front axle mounting bracket to frame nuts.
11. Slide the front axle mounting bracket towards the engine. It may be necessary to pull down on the inner axle housing and/or push up on the mounting bracket in order to gain clearance.
12. Remove the inner axle shaft housing bolts from the differential carrier case.
13. Carefully remove the inner axle shaft housing assembly from the differential carrier assembly.
14. For the 8.25 inch axle, remove the following components from the inner axle shaft housing:
    a. The clutch fork inner spring (10).
    b. The clutch fork assembly (11).
    c. The clutch shaft shim (9).
    d. The clutch sleeve (8).
    e. The clutch gear (6) by doing the following:
    f. Clamp the inner axle shaft housing (4) in a vise. Clamp only on the mounting flange.
    g. Strike the inside surface of the shaft (1) flange with a hammer and a brass drift in order to dislodge the front drive axle clutch gear (6) from the inner axle shaft (1).
    h. The thrust washer (5).
15. For the 9.25 inch axle, remove the



1. Inner axle shaft
4. Inner shaft housing
5. Thrust washer
6. Clutch gear
7. Washer
8. Clutch sleeve
9. Inner sleeve
10. Clutch fork inner spring
11. Clutch for assembly

Exploded view of the front axle assembly—8.25 S4WD and 9.25 axles

following components from the inner axle shaft housing:

a. The clutch fork inner spring (10).
b. The clutch fork assembly (11).
c. The clutch shaft shim (9).
d. The clutch sleeve (8).
e. The retainer ring (7).
f. The thrust washers (5, 6).

16. Remove the inner axle shaft (2). Tap out the inner axle shaft with a soft-faced mallet, if necessary.

17. Remove the inner axle seal and the bearing from the axle housing.

18. If only replacing the left side inner axle shaft, remove the wheel drive shaft inboard flange bolts from the inner axle shaft. Disconnect the wheel drive shaft from the inner axle shaft.

19. Remove the inner axle shaft using a hammer and a brass drift.

20. Install the inner axle shaft housing into a vise. Clamp only on the mounting flange of the inner axle shaft housing.

21. Install the bushing and bearing removal tool J-29369-1, 8.25 inch axle, or J-29369-2, 9.25 inch axle, behind the inner axle shaft seal or the inner axle shaft bearing as necessary.

22. Install a slide hammer to the removal tool.

23. Remove the inner axle shaft seal and/or the inner axle shaft bearing using the slide hammer.

24. If only replacing the left side seal, place an alignment mark between the inner axle shaft and the wheel drive shaft.

25. Disconnect the wheel drive shaft from the inner axle shaft.

26. Remove the inner axle shaft using a hammer and a brass drift.

27. Remove the inner axle shaft seal using a suitable seal remover tool.

To install:

28. Install the right side bearing with the square shoulder in using and axle bearing tube installer and a universal driver handle.

29. Install the new axle shaft seal using the sane tools.

30. Install the inner axle shaft into the inner axle shaft housing. Carefully tap the inner axle shaft into place with a soft-faced mallet.

31. Install the inner axle shaft and clutch fork assembly components into the inner shaft housing.

32. If only the left side inner axle shaft was removed, install the shaft by performing the following steps:

33. Install the inner axle shaft into the differential case side gear using a soft-faced mallet until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.

34. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.

35. Connect the halfshaft to the inner axle shaft.

36. Install the halfshaft inboard flange to inner axle shaft bolts and tighten to 58 ft. lbs. (79 Nm).

37. If the right side inner axle shaft and/or housing was removed, install the shaft and/or housing using the following steps:

38. Install the new inner axle shaft bearing and the seal to the axle housing.

39. Install the inner axle shaft (2) into the inner axle shaft housing (1). Carefully tap the inner axle shaft into place with a soft-faced mallet.

40. Place the inner axle shaft housing on end so that the splines of the inner axle shaft is facing up.

41. For the 8.25 inch axle, install the following components into the inner axle shaft housing:

➡Use chassis grease in order to hold the thrust washer in place.

42. The thrust washer (5) Ensure the tabs on the thrust washer are aligned with the slots in the inner axle shaft housing (4).

43. The retainer ring (7) into the clutch gear (6).

44. The clutch gear (6) onto the inner axle shaft (1). Drive the clutch gear into place with a plastic hammer.

45. Install the original shim to the shaft. Use the chassis grease in order to hold the shim in place.

46. Install the inner axle housing assembly to the differential carrier case. Do not use sealer at this time.

47. Install the bolts and tighten to 30 ft. lbs. (40 Nm).

48. Install a dial indicator on the axle tube end. The plunger of the indicator must be at a right angle to the axle flange.

49. Move the shaft back and forth and read the end play. The correct end play is 0.001-0.020 in (0.03-0.51mm).

50. If the end play is incorrect, install a thicker or thinner shim as needed in order to bring the end play into the specified range.

51. Install the clutch gear shim (9). clutch sleeve (8), clutch fork assembly (11) and clutch fork inner spring (10).

52. For the 9.25 inch axle, install the following components into the inner axle shaft housing:

53. The thrust washer (5) Ensure the tabs on the thrust washer are aligned with the slots in the inner axle shaft housing (4).

54. The second thrust washer (6).

55. The retainer ring (7) onto the inner axle shaft (1).

56. Determine the clutch gear shim thickness.

57. Install the clutch gear shim (9). clutch sleeve (8), clutch fork assembly (11) and clutch fork inner spring (10).

58. Apply sealant to the inner axle housing to differential carrier sealing surface.

59. Install the inner axle shaft housing assembly to the differential carrier assembly.

60. Install the inner axle shaft housing bolts and tighten to 30 ft. lbs. (40 Nm).

61. For 25/35 series vehicles, perform the following steps in order to install the front axle mounting bracket to the inner axle shaft housing:

62. Slide the front axle mounting bracket towards the frame. Install the front axle mounting bracket studs into the inner shaft housing mounting flange. It may be necessary to push up on the front axle mounting bracket and/or pull down on the inner axle housing in order to gain enough clearance to install the mounting bracket studs into the inner shaft housing.

63. Install the front axle mounting bracket to frame nuts.

64. Install the inner axle shaft housing washers and nuts to the bracket and tighten to 75 ft. lbs. (100 Nm).

65. Connect the wheel drive shaft inboard flange to the inner axle shaft and tighten to 30 ft. lbs. (40 Nm).

66. Install the wheel drive shaft inboard flange to the inner axle shaft bolts and tighten to 58 ft. lbs. (79 Nm).

67. Connect the wire harness to the inner axle shaft housing.

68. Connect the electrical connector to the front axle actuator.

69. Install the stabilizer shaft link assembly.

70. With either replacement procedure, fill the differential carrier assembly with axle lubricant.

71. Lower the vehicle.

8.25 F4WD AXLE

1. Raise and support the vehicle.

2. Drain the differential carrier assembly.

3. If only replacing the right side inner shaft and/or housing, follow the steps below. If only replacing the left side inner shaft, proceed to step 16.

4. Remove the stabilizer shaft link assembly.

5. Remove the wheel drive shaft inboard flange bolts from the inner axle shaft.

6. Disconnect the wheel drive shaft from the inner axle shaft.

7. Disconnect the inner axle shaft from the differential case side gear using a hammer and brass drift. Remove the inner axle shaft housing nuts from the bracket.

8. Remove the inner axle shaft housing bolts from the differential carrier assembly.

9. Remove the inner axle shaft and inner axle shaft housing from the vehicle.

10. Remove the inner axle shaft from the inner axle shaft housing.

11. Remove the inner axle shaft seal and the bearing from the inner axle shaft housing.

12. Install the inner axle shaft housing into a vise. Clamp only on the mounting flange of the inner axle shaft housing.

13. Install the bushing and bearing removal tool J-29369-1, 8.25 inch axle, or J-29369-2, 9.25 inch axle, behind the inner axle shaft seal or the inner axle shaft bearing as necessary.

14. Install a slide hammer to the removal tool.

15. Remove the inner axle shaft seal and/or the inner axle shaft bearing using the slide hammer.

16. If only replacing the left side seal, place an alignment mark between the inner axle shaft and the wheel drive shaft.

17. Disconnect the wheel drive shaft from the inner axle shaft.

18. Remove the inner axle shaft using a hammer and a brass drift.

19. Remove the inner axle shaft seal using a suitable seal remover tool.

To install:

20. Install the right side bearing with the square shoulder in using and axle bearing tube installer and a universal driver handle.

21. Install the new axle shaft seal using the sane tools.

22. Install the inner axle shaft into the inner axle shaft housing. Carefully tap the inner axle shaft into place with a soft-faced mallet.

23. Install the inner axle shaft and clutch fork assembly components into the inner shaft housing.

24. If only the left side inner axle shaft was removed, install the shaft by performing the following steps:

25. Install the inner axle shaft into the differential case side gear using a soft-faced mallet until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.

26. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.

27. Connect the halfshaft to the inner axle shaft.

28. Install the halfshaft inboard flange to inner axle shaft bolts and tighten to 58 ft. lbs. (79 Nm).

29. If the right side inner axle shaft and/or housing was removed, install the shaft and/or housing using the following steps.

30. Install the new inner axle shaft bearing and the new seal to the inner axle shaft housing.

31. Install the inner axle shaft into the inner axle shaft housing. Do not install the inner axle shaft completely into the inner axle shaft housing at this time.

32. Apply sealant to the inner axle housing to differential carrier sealing surface.

33. Install the inner axle shaft and the inner axle shaft housing to the differential carrier assembly.

34. Install the inner axle shaft housing bolts and tighten to 30 ft. lbs. (40 Nm).

35. Install the inner axle shaft housing nuts to the bracket and tighten to 75 ft. lbs. (100 Nm).

36. Install the inner axle shaft into the differential case side gear by doing the following:

37. Turn the inner axle shaft and align the splines of the inner axle shaft with the splines on the differential side gear.

38. Install the inner axle shaft into the differential case side gear using a soft-faced mallet until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.

39. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.

40. Install the wheel drive shaft inboard flange to the inner axle shaft.

41. Install the wheel drive shaft inboard flange to inner axle shaft bolts and tighten to 58 ft. lbs. (79 Nm).

42. Install the stabilizer shaft link assembly.

43. Fill the differential carrier assembly with axle lubricant

44. Lower the vehicle.

Express and Savana

1. Raise the vehicle.

2. Drain the differential carrier assembly.

3. Remove the engine protection shield.

4. Disconnect the wheel drive shaft from the inner axle shaft.

5. Place a pry bar between the inner axle shaft flange and the inner axle shaft housing.

6. Disconnect the inner axle shaft from the differential case side gear using the pry bar. Do not remove the inner axle shaft at this time.

7. Install a support jack underneath the differential carrier assembly.

8. Remove the upper inner shaft housing bushing bolt and nut.

9. Remove the lower inner shaft housing bushing bolt and nut.

10. Remove the inner axle shaft housing bolts from the differential carrier assembly.

11. Remove the inner axle shaft and inner axle shaft housing from the vehicle.

12. Remove the inner axle shaft from the inner axle shaft housing.

13. Remove the inner axle shaft seal and the bearing from the inner axle shaft housing using a bearing remover and slide hammer.

To install:

14. Install the new inner axle shaft bearing and the new seal to the inner axle shaft housing using a bearing installer and universal driver handle.

15. Install the inner axle shaft into the inner axle housing. Do not install the inner axle shaft completely into the inner axle shaft housing at this time.

16. Apply sealant to the inner axle housing to differential carrier sealing surface.

17. Install the inner axle shaft housing with the inner axle shaft to the differential carrier assembly.

18. Install the inner axle shaft housing bolts and tighten to 35 ft. lbs. (48 Nm).

19. Install the lower inner axle shaft housing bushing bolt and nut.

20. Install the upper inner axle shaft housing bushing bolt and nut and tighten to 63 ft. lbs. (85 Nm).

21. Remove the support jack.

22. Carefully guide the inner axle shaft through the inner axle housing until the retaining ring on the inner axle shaft contacts the differential case side gear.

23. Install the inner axle shaft into the differential case side gear by tapping the retaining ring into the retaining groove using a soft-faced mallet and until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.

24. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.

25. Install the wheel drive shaft to the inner axle shaft.

26. Fill the differential carrier assembly with axle lubricant.
27. Lower the vehicle.

Rear Axle Shaft, Bearing and Seal

REMOVAL & INSTALLATION

8.5 Inch and 9.5 Inch Rear Axles

1. Raise and support the vehicle on a hoist.
2. Remove or disconnect the following:
    - Tire and wheel assembly
    - Brake caliper
    - Rear cover and the gasket
    - Pinion shaft locking screw.
    - Pinion shaft, on axles without locking differential
3. On axles with a locking differential, remove the shaft part way. Rotate the case until the pinion shaft touches the housing.
4. On axles with a locking differential, use a screwdriver, or a similar tool, in order to enter the differential case and rotate the lock until the lock aligns with the thrust block.
5. Push the flange of the axle shaft toward the differential. Remove the lock from the button end of the axle shaft.

➡When removing the axle shaft, do not rotate the shaft. Rotating the shaft will misalign the gears. Misaligning the gears will make the assembly difficult.

6. Remove the axle shaft from the housing.
7. If replacing only the axle shaft seal, remove the seal using a suitable seal removal tool.
8. Remove the bearing using a bearing remover.
9. Inspect all the parts for damage. Replace the parts as necessary.

To install:

10. Install a new bearing using a bearing installer.
11. Install new seal using a seal installer. Ensure the seal is fully seated in the axle tube.

➡Carefully insert the axle shaft in order to not damage the seal.

12. Install the axle shaft into the housing. Slide the axle shaft into place allowing the splines to engage the differential side gear.
13. On axles without a locking differential, place the lock on the button end of the axle shaft.
14. On axles with a locking differential, keep the pinion shaft partially withdrawn.
15. On axles with a locking differential, place the lock on the axle shaft so that the ends are flush with the thrust block. Pull the shaft flange outward in order to seat the lock in the differential gear.

➡Anytime you remove a differential pinion shaft locking screw, coat the screw threads with Loctite® 242 before reinstalling the screws. The screw has an adhesive coating in order to prevent the screw from loosening in the case. Removing the screw removes the adhesive on the screw.

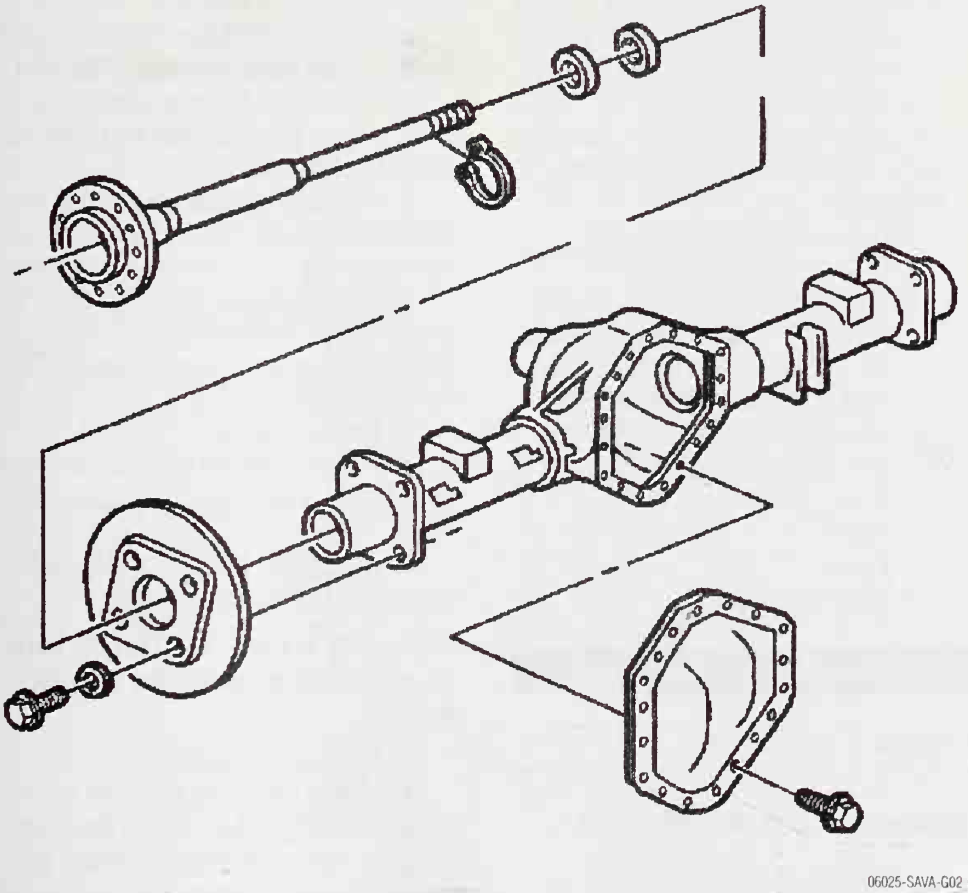
16. Align the hole in the pinion shaft with the screw hole in the differential case.
17. Install or connect the following:
    - Pinion flange locking bolt and tighten to 25 ft. lbs. (34 Nm).
    - Rear cover and the gasket
    - Brake caliper
    - Tire and wheel assembly
18. Fill the rear axle.
19. Remove the supports and lower the vehicle.

8.6 Inch Rear Axles

1. Raise and support the vehicle on a hoist.
2. Remove the tire and wheel assembly.
3. Remove the brake caliper on disc brake models.
4. Remove the rear cover and gasket.
5. Remove the pinion shaft locking bolt.
6. On axles without a locking differential, remove the pinion shaft.
7. On axles with a locking differential, remove the shaft part way. Rotate the case until the pinion shaft touches the housing.
8. On axles with a locking differential, use a screwdriver, or a similar tool, in order to enter the differential case and rotate the lock until the lock aligns with the thrust block.
9. Remove the brake drum on drum brake models.
10. Push the flange of the axle shaft in toward the differential.
11. Remove the C-lock from the button end of the axle shaft.
12. When removing the axle shaft, do not rotate the shaft. Rotating the shaft will misalign the gears. Misaligning the gears will make assembly difficult.
13. Remove the axle shaft from the housing.

To install:

14. Install the axle shaft into the rear axle housing.
15. Slide the axle shaft into place allow-



Exploded view of the rear axle—8.5/8.6/9.5 inch ing the splines to engage the differential side gear.

16. On axles without a locking differential, place the C-lock on the button end of the axle shaft.

17. On axles with a locking differential, keep the pinion shaft partially withdrawn.

18. Install the brake drum on drum brake models.

19. On axles with a locking differential, place the C-lock on the axle shaft so that the ends are flush with the thrust block.

20. Pull the shaft flange outward in order to seat the lock in the differential gear.

21. Align the hole in the pinion shaft with the bolt hole in the differential case.

22. Install the new pinion shaft locking bolt and tighten to 25 ft. lbs. (35 Nm).

23. Install the rear cover and the gasket.

24. Install the caliper on disc brake models.

25. Install the tire and wheel assembly.

26. Fill the rear axle, using the proper fluid.

27. Lower the vehicle.

9.75 Inch Rear Axles

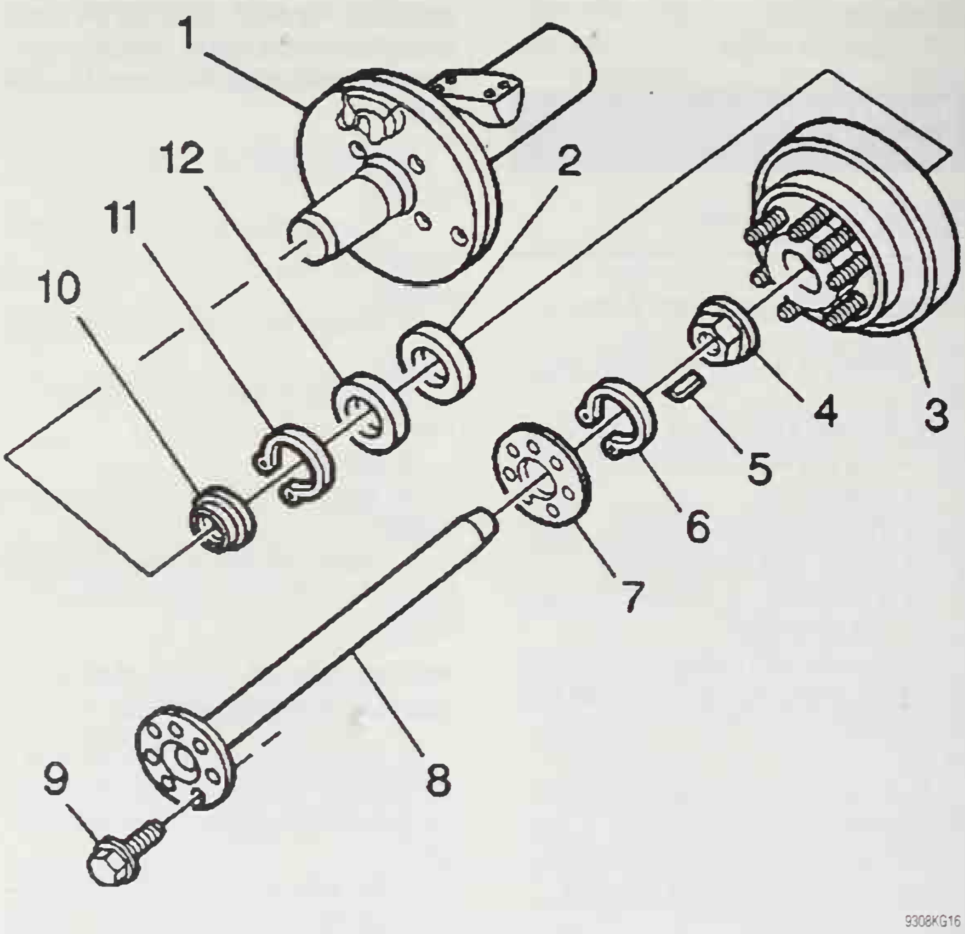
1. Release the parking brake.
2. Raise and support the vehicle.
3. Remove the tire and wheel assembly.
4. Remove the rear steering gear assembly.
5. Remove the steering knuckle assembly.
6. Remove the lock clip from the axle shaft end. The lock clip is spring loaded and fits securely in the axle shaft slot and may need to be push off the shaft end with a screw driver or related tool. Pushing the axle shaft inwards towards the gears my help in removal of the lock clip.
7. When removing the axle shaft do not rotate the shaft. Rotating the shaft will cause the gears to move. Misalignment of the gears will make the assembly difficult.
8. Remove the axle shaft.

To install:

9. Install the axle shaft.
10. Install the spring loaded lock clip to the axle shaft end.
11. Install the steering knuckle assembly.
12. Install the rear steering gear assembly.
13. Install the tire and wheel assembly.
14. Lower the vehicle.

10.5 Inch Rear Axles

1. Remove or disconnect the following:
   - Tire and wheel
   - Brake caliper
   - Brake rotor
   - Flange bolts
2. Sharply rap the axle shaft with a soft-faced hammer in order to loosen the shaft. Grip the rib on the axle shaft flange with a locking pliers. Twist the axle shaft flange in order to start the axle shaft removal. Remove the axle shaft from the tube.



Rear axle shaft removal—10.5 inch 25 Series Silverado

3. Remove the gasket.
4. Clean the axle shaft flange and the outside face of the hub assembly. Inspect all the parts. Replace the parts as necessary.

To install:

5. Install or connect the following:
   - Gasket onto the axle shaft
   - Gasket and axle shaft into the tube. Ensure the shaft splines mesh into the differential side gear. Align the holes in the axle flange and the gasket with the holes in the hub.
   - Axle flange bolts and tighten to 110 ft. lbs. (150 Nm).
   - Rotor
   - Caliper
   - Wheel and tire

Front Drive Axle Pinion Seal

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Raise the vehicle on a hoist.
2. Remove the tire and wheel.
3. Remove the brake calipers.
4. Remove the differential carrier assembly shield, if equipped.
5. Reference mark the relationship of the propeller shaft to the front axle pinon yoke.
6. Remove the propeller shaft.
7. Tie the propeller shaft to a frame rail or the crossmember.
8. Measure the torque required in order to rotate the pinion. Record the torque value for reassembly.
9. Scribe a line on the pinion stem, the pinion nut and the companion flange. Record the number of exposed threads on the pinion stem.
10. Remove the nut.
11. Position tool J8614-01 on the flange so that the 4 notches on the tool face the flange.
12. Remove the flange. Use the special nut and the forcing screw.

➡Carefully pry the seal from the bore. Do not distort or scratch the aluminum case.

13. Remove the oil seal.
14. Inspect the pinion flange for a smooth oil seal surface. Inspect the pinion flange for worn drive splines. Replace the pinion flange if necessary.

15. Remove the dust deflector.

To install:

➡Stake the new deflector at 3 new equally spaced positions. You must stake the new deflector in such a way that you do not damage the seal operating surface.

16. Install and stake the dust deflector on the flange.

17. Position the oil seal in the bore. Then place a driver over the oil seal. Strike the driver with a hammer until the seal flange seats on the axle housing surface. Drive the seal in straight, not at an angle, as this will damage the aluminum housing.

➡Do not hammer the pinion flange/yoke onto the pinion shaft. Pinion components may be damaged if the pinion flange/yoke is hammered onto the pinion shaft.

18. Install the flange onto the pinion using tool J8614-01. Place the washer and a new nut on the pinion threads. Tighten the nut to the original scribed position using the scribe marks and the exposed threads as reference.

19. Measure the rotating torque of the pinion. Compare the measurement with the rotating torque recorded earlier. Tighten the pinion nut by small increments until the torque required in order to rotate the pinion is 3 inch lbs. (0.35 Nm) greater than the original torque.

20. Install the propeller shaft.

21. Install the differential carrier assembly shield, if equipped.

22. Install the brake calipers

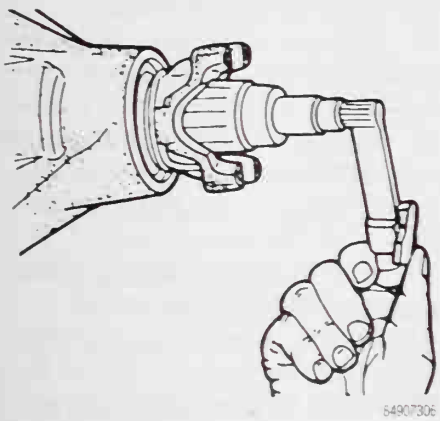
23. Install the tire and wheel.

24. Lower the vehicle.

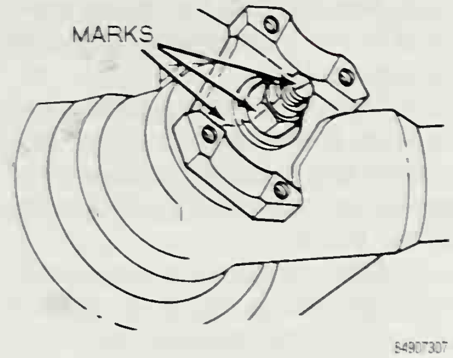
Express and Savana

1. Raise and support the front end on jackstands.

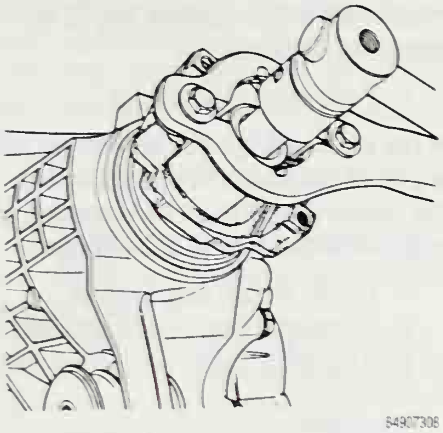
2. Matchmark and disconnect the front driveshaft at the carrier.



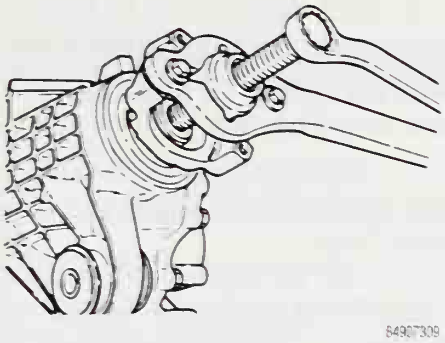
Measuring the pinion rotating torque



View of the scribed marks



Removing the pinion nut



Removing the pinion flange

3. Remove or disconnect the following:
   - Wheels
   - Calipers and wire them up, out of the way

4. Position an inch pound torque wrench on the pinion nut. Measure the torque needed to rotate the pinion one full revolution. Record the figure.

5. Matchmark the pinion flange, shaft and nut. Count and record the number of exposed threads on the pinion shaft.
   - Nut and washer, while holding the flange
   - Flange, using a puller
   - Seal from its bore by carefully prying it. Be careful to avoid scratching the seal bore.
   - Deflector from the flange

To install:

6. Clean the seal bore thoroughly.

7. Remove any burrs from the deflector staking on the flange.

8. Tap the deflector onto the flange and stake it in three places.

9. Position the new seal in the carrier bore and drive it into place until flush. Coat the seal lips with wheel bearing grease.

10. Coat the outer edge of the flange neck with wheel bearing grease and slide it onto the pinion shaft.

11. Place a new nut and washer onto the pinion shaft and tighten it to the position originally recorded. That is, the alignment marks are aligned, and the recorded number of threads are exposed on the pinion shaft.

WARNING

Never hammer the flange onto the pinion!

12. Measure the rotating torque of the pinion. Compare this to the original torque. Tighten the pinion nut, in small increments, until the rotating torque is 3 inch lbs. (0.35 Nm) GREATER than the original torque.

13. Install the driveshaft.

14. Install the calipers and install the wheels.

Rear Drive Axle Pinion Seal

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Raise the vehicle.

2. Remove the tire and wheel assemblies (8.6 inch, 9.5 inch axles).

3. Remove the rear brake calipers and rotors (8.6 inch, 9.5 inch axles).

4. Remove the axle shafts (10.5 inch, 11.5 inch axle).

5. Reference mark the rear propeller shaft to the rear axle pinion yoke.

6. Disconnect the propeller shaft from the axle.

7. Measure the torque required to turn the pinion. Record the torque number measurement which gives the combined pinion bearing, seal, carrier bearing, axle bearing and seal preload.

8. Make and accurate alignment mark on the pinion flange. Record the number of exposed threads on the pinion stem.

9. Remove the pinion flange nut and the washer. Use a container in order to catch any lubricant.

➡Use care not to damage any of the machined surfaces.

10. Remove the pinion flange.

➡The pinion flange has an oil seal that is part of the pinion flange assembly. The pinion flange must be inspected to ensure that the seal is not damaged.

11. Pry the oil seal from the bore.
12. Thoroughly clean any foreign material from the contact area. Replace any parts as necessary.

To install:

13. Lubricate the cavity between the lips of the oil seal with wheel bearing lubricant.
14. Install the oil seal into the bore using a driver.

➡Do not hammer the pinion flange onto the pinion stem.

15. Install the pinion flange. Use the alignment marks in the installation of the pinion flange.
16. Install the washer and a new nut. Tighten the nut on the pinion stem as close as possible to the alignment marks without going past the marks. Use the alignment marks and the thread count as a reference. Tighten the nut a little at a time. Turn the pinion flange several times after each tightening in order to seat the rollers.
17. Measure the torque required to rotate the pinion flange. Compare this to the original torque. Tighten the pinion nut, in small increments, until the rotating torque is 3 inch lbs. (0.35 Nm) GREATER than the original torque.
18. Align the propeller shaft with the alignment marks. Connect the propeller shaft.
19. Install the axle shafts (10.5 inch, 11.5 inch axle).
20. Install the rear brake calipers and rotors (8.6 inch, 9.5 inch axles).
21. Install the tire and wheel assemblies (8.6 inch, 9.5 inch axles).

Express and Savana

1. Raise the vehicle on a hoist.

➡Observe and accurately mark the positions of all driveline components relative to the propeller shaft and axles prior to disassembly. These components include the propeller shaft, drive axles, pinion flanges, output shafts, etc. Reassemble all components in the exact relationship the components had to each other during removal. Follow the specifications and the torque values. Follow any measurements made prior to removal.

2. Accurately mark the installed position of the rear propeller shaft. Remove the rear propeller shaft.
3. Measure the torque required to turn the pinion. Record the torque number measurement which gives the combined pinion bearing, seal, carrier bearing, axle bearing and seal preload.
4. Make and accurate alignment mark on the pinion flange. Record the number of exposed threads on the pinion stem.
5. Remove the pinion flange nut and the washer. Use a container in order to catch any lubricant.

➡Use care not to damage any of the machined surfaces.

6. Remove the pinion flange.

➡The pinion flange has an oil seal that is part of the pinion flange assembly. The pinion flange must be inspected to ensure that the seal is not damaged.

7. Pry the oil seal from the bore.
8. Thoroughly clean any foreign material from the contact area. Replace any parts as necessary.

To install:

9. Lubricate the cavity between the lips of the oil seal with wheel bearing lubricant.
10. Install the oil seal into the bore using a driver.

➡Do not hammer the pinion flange onto the pinion stem.

11. Install the pinion flange. Use the alignment marks in the installation of the pinion flange.
12. Install the washer and a new nut. Tighten the nut on the pinion stem as close as possible to the alignment marks without going past the marks. Use the alignment marks and the thread count as a reference. Tighten the nut a little at a time. Turn the pinion flange several times after each tightening in order to seat the rollers.
13. Measure the torque required to rotate the pinion flange. Compare this to the original torque. Tighten the pinion nut, in small increments, until the rotating torque is 3 inch lbs. (0.35 Nm) GREATER than the original torque.
14. Align the propeller shaft with the alignment marks. Connect the propeller shaft.
15. Install the retainers and the bolts. Tighten the bolts to 15 ft. lbs. (20 Nm).
16. Fill the rear axle.
17. Lower the vehicle.

Front Drive Axle Differential Carrier

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Turn the steering wheel all the way to the left.
2. Raise and support the vehicle.
3. Place jack or utility stands at the rear end of the vehicle.
4. Remove the engine protection shield.
5. Remove the front differential carrier assembly shield, if equipped.
6. Drain the differential carrier assembly, if necessary.
7. Disconnect the front propeller shaft from the differential carrier assembly.
8. Remove the relay rod.
9. Support the differential carrier assembly with a transmission jack.
10. Remove the wheel drive shaft inboard flange bolts from the inner axle shaft, both sides.
11. Disconnect the electrical connector from the front axle actuator, S4WD axle only.
12. Disconnect the wire harness from the inner axle shaft housing and differential, S4WD axle only.
13. Disconnect the vent hose from the differential carrier assembly.
14. Remove the inner axle housing nuts and washers from the bracket.
15. Remove the differential carrier assembly upper mounting bolt and the nut.
16. Pivot the differential carrier assembly forward and down on the lower mount bolt while it is being supported by the transmission jack.
17. Secure the differential carrier assembly to the jack.
18. Remove the differential carrier assembly lower mounting bolt and the nut.
19. Remove the differential carrier.

To install:

20. Install the differential carrier.
21. Install the differential carrier assembly lower mounting bolt and the nut. Do not tighten the bolt at this time.
22. Pivot the differential carrier assembly up and back on the lower mount bolt while it is being supported by the transmission jack.
23. Install the differential carrier assembly upper mounting bolt and the nut.
24. Install the inner axle housing washers and nuts to the bracket.
25. Tighten the inner axle housing nuts

and the upper and the lower differential carrier assembly bolts to 75 ft. lbs. (100 Nm).

26. Connect the vent hose to the differential carrier assembly.

27. Remove the transmission jack.

28. Connect the electrical connector from the front axle actuator, S4WD axle only.

29. Connect the wire harness from the inner axle shaft housing and differential, S4WD axle only.

30. Install the wheel drive shaft inboard flange to inner axle shaft bolts, both sides, and tighten to 58 ft. lbs. (79 Nm).

31. Install the relay rod.

32. Install the front propeller shaft to the differential carrier assembly.

33. Fill the differential carrier assembly.

34. Install the front differential carrier assembly shield, if equipped.

35. Install the engine protection shield.

36. Lower the vehicle.

Express and Savana

1. Raise and support the vehicle.

2. Place a jack or utility stands at the rear end of the vehicle.

3. Drain the fluid from the differential carrier assembly .

4. Disconnect the propeller shaft from the differential carrier assembly.

5. Support the propeller shaft as necessary.

6. Remove the engine protection shield.

7. Remove the front engine crossmember.

8. Place a transmission jack under the differential carrier assembly. Secure and support the differential carrier assembly to the transmission jack.

9. Place an alignment mark between the wheel drive shafts and the inner shaft flanges.

10. Remove the wheel drive shaft to inner shaft bolts.

11. Disconnect the left side wheel drive shaft from the inner shaft.

12. Disconnect the right side wheel drive shaft from the inner shaft.

13. Disconnect the differential carrier assembly vent hose from the differential carrier assembly.

14. Remove the upper inner shaft housing mounting bolt.

15. Remove the upper differential carrier assembly mounting bolt.

16. Remove the differential carrier assembly.

To install:

17. Install the differential carrier assembly to the vehicle.

18. Connect the vent hose to the differential carrier assembly.

19. Install the differential carrier assembly upper mounting bolt and the nut. Do not tighten the bolt to specification at this time.

20. Install the inner shaft upper mounting bolt and the nut. Do not tighten the bolt to specification at this time.

21. Install the front engine crossmember and tighten the bolts to 48 ft. lbs. (65 Nm).

22. Tighten the upper differential carrier assembly and inner shaft housing mounting bolts to 63 ft. lbs. (85 Nm).

23. Connect the left side wheel drive shaft to the inner shaft flange. Align the marks made during removal.

24. Clean the threads of the left and right side drive shaft bolt with denatured alcohol or equivalent and allow to dry.

25. Apply threadlocker to the threads of the bolts.

26. Install the right and left side wheel drive shaft to inner shaft bolts and tighten to 37 ft. lbs. (50 Nm).

27. Install the engine protection shield.

28. Connect the propeller shaft to the differential carrier assembly.

29. Fill the differential carrier assembly with the proper lubricant.

30. Remove the jack or utility stands.

31. Lower the vehicle.

Rear Drive Axle Housing

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

2002–04 MODELS

1. Remove or disconnect the following:
   - Axle lubricant
   - Propeller shaft
   - Wheel assemblies
   - Parking brake cable
   - Brake calipers
   - Shock absorbers from the axle brackets
   - Vent hose from the rear axle vent fitting
   - Nuts and the washers from the U-bolts
   - U-bolts, the spring plates and the spacers from the axle assembly
2. Lower the axle assembly.

To install:

3. Place the rear axle assembly under the vehicle. Align the rear axle assembly with the springs. Connect the spacers, the spring plates and the U-bolts to the rear axle. Raise the rear axle assembly into position.

4. Install or connect the following:
   - Washers and nuts to the U-bolts. Tighten the nuts to 59 ft. lbs. (80 Nm) first, then to 89 ft. lbs. (120 Nm).
   - Vent hose to the rear axle vent fitting
   - Shock absorbers to the rear axle
   - Brake calipers
   - Parking brake cable
   - Wheel assemblies
   - Propeller shaft

5. Fill the rear axle.

6. Bleed the brake system.

7. Remove the supports and lower the vehicle.

2005–06 MODELS

1. Raise and support the vehicle.

2. Place jack stands at the front end of the vehicle.

3. Support the axle with jack stands.

4. Remove the tire and wheel assemblies.

5. Disconnect the upper stabilizer shaft link from the frame.

6. Reference mark the rear propeller shaft to the rear axle pinion yoke.

7. Disconnect the propeller shaft from the axle. Support the propeller shaft as necessary.

8. Disconnect the lower mount of the shock absorbers.

9. Disconnect the vent hose.

10. Disconnect the park brake cables.

11. Disconnect the junction block and brake pipe.

12. Remove and wire the calipers out of the way.

13. Remove the nuts and the washers from the spring assembly U-bolts.

14. Remove the U-bolts, the anchor plates and the spacers from the axle.

15. Remove the axle with the aid of a hydraulic assist.

16. Remove the stabilizer shaft U-bolt nuts and the U-bolts from the axle if necessary.

17. Remove the stabilizer shaft from the axle if necessary.

To install:

18. Install the stabilizer shaft to the axle if necessary.

19. Install the stabilizer shaft clamps, the U-bolts, and the nuts if necessary. Do not torque the stabilizer shaft U-bolt nuts at this time.

20. Place the axle under the vehicle.

21. Raise the axle to the springs with the aid of a hydraulic assist. Align the axle with the springs.

22. Install the spacers, the anchor plates and the U-bolts.

23. Install the washers if equipped and the nuts to the U-bolts and tighten in a crisscross pattern to 110 ft. lbs. (150 Nm).

24. Install the stabilizer shaft link to the frame if necessary.

25. Install the stabilizer shaft link bolt and the nut and tighten to 70 ft. lbs. (95 Nm).

26. Tighten the stabilizer shaft U-bolt nuts to 24 ft. lbs. (32 Nm).

27. Install the brake calipers.

28. Install the brake pipe fitting brackets.

29. Install the brake pipe.

30. Install the brake pipe junction block.

31. Connect the park brake cables.

32. Connect the vent hose to the axle vent fitting.

33. Install the shock absorbers to the lower mount bracket.

34. Install the shock absorber bolts and the nuts and tighten to 70 ft. lbs. (95 Nm).

35. Install the propeller shaft to the pinion yoke. Align the reference marks made during removal.

36. Install the propeller shaft yoke retaining clamps and the bolts and tighten to 18 ft. lbs. (25 Nm).

37. Install the tire and wheel assemblies.

38. Fill the axle with lubricant.

39. Remove the jack stands.

40. Lower the vehicle.

Express and Savana

2002–04 MODELS

1. Drain the lubricant from the axle housing
2. Remove or disconnect the following:
   - Driveshaft
   - Wheel, the brake drum or hub and the drum assembly
   - Parking brake cable from the lever and at the brake flange plate
   - Hydraulic brake lines from the connectors
   - Shock absorbers from the axle brackets
   - Vent hose from the axle vent fitting, if equipped
   - Height sensing and brake proportional valve linkage, if equipped
   - Stabilizer shaft, if equipped
3. Support the axle assembly with a jack.
   - U-bolts
   - Spring plates and spacers
   - Axle assembly

To install:

4. Raise the axle assembly into position.
5. Install or connect the following:
   - U-bolts
   - Spring plates and spacers
   - Nuts and washers on the U-bolts. Torque to 81 ft. lbs. (110 Nm).
   - Stabilizer shaft, if equipped
   - Height sensing and brake proportional valve linkage, if equipped
   - Vent hose at the axle vent fitting, if equipped
   - Shock absorbers at the axle brackets
   - Hydraulic brake lines
   - Parking brake cable
   - Wheels
   - Driveshaft
6. Fill the axle housing.

2005–06 MODELS

1. Drain the lubricant from the axle housing

2. Raise and support the vehicle.

3. Place jack stands at the front end of the vehicle.

4. Support the rear axle with jack or utility stands.

5. Remove the wheel and tire assemblies.

6. Disconnect the electrical connector from the rear wheel speed sensor, if equipped.

7. Remove the brake calipers from the rear axle. It is not necessary to disconnect the brake hose from the caliper. Support the brake calipers as necessary and set aside.

8. Disconnect the propeller shaft from the rear axle. Support the propeller shaft as necessary and set aside.

9. Disconnect the park brake cables.

10. Remove the rear axle vent hose from the axle.

11. Disconnect the lower portion of the shock absorber from the rear axle.

12. Remove the rear spring U-bolts, the rear spring anchor plates and the rear spring spacers from the vehicle.

13. Remove the rear axle from the vehicle.

To install:

14. Install the rear axle to the vehicle. Support the rear axle with jack or utility stands.

15. Install the rear spring U-bolts, the rear spring anchor plates and the rear spring spacers to the vehicle.

16. Install the leaf spring U-bolt nuts. Tighten the leaf spring U-bolt mounting nuts to 63 ft. lbs. (85 Nm) on 1500 models, 103–108 ft. lbs. (140–147 Nm) on 2500 Series and 3500 Series Cargo and Passenger Vans and Cutaways.

17. Tighten the front hanger bracket nut to 80 ft. lbs. (110 Nm), plus an additional 200 degrees.

18. Tighten the spring shackle mounting nuts to 66 ft. lbs. (90 Nm).

19. Connect the lower portion of the shock absorber to the rear axle.

20. Install the rear axle vent hose to the rear axle.

21. Connect the park brake cable to the rear axle.

22. Connect the propeller shaft to the rear axle.

23. Install the brake calipers.

24. Connect the electrical connector to the rear wheel speed sensor, if equipped.

25. Install the wheel and tire assemblies.

26. Fill the rear axle with the proper axle lubricant.

27. Remove the jack stands.

28. Lower the vehicle.

STEERING AND SUSPENSION

Air Bag

⁂ CAUTION

Some vehicles are equipped with an air bag system. The system must be disabled before performing service on or around system components, steering column, instrument panel components, wiring and sensors. Failure to follow safety and disabling procedures could result in accidental air bag deployment, possible personal injury and unnecessary system repairs.

PRECAUTIONS

Several precautions must be observed when handling the inflator module to avoid accidental deployment and possible personal injury.

- Never carry the inflator module by the wires or connector on the underside of the module
- When carrying a live inflator module, hold securely with both hands, and ensure that the bag and trim cover are pointed away
- Place the inflator module on a bench or other surface with the bag and trim cover facing up
- With the inflator module on the bench, never place anything on or close to the module that may be thrown in the event of an accidental deployment

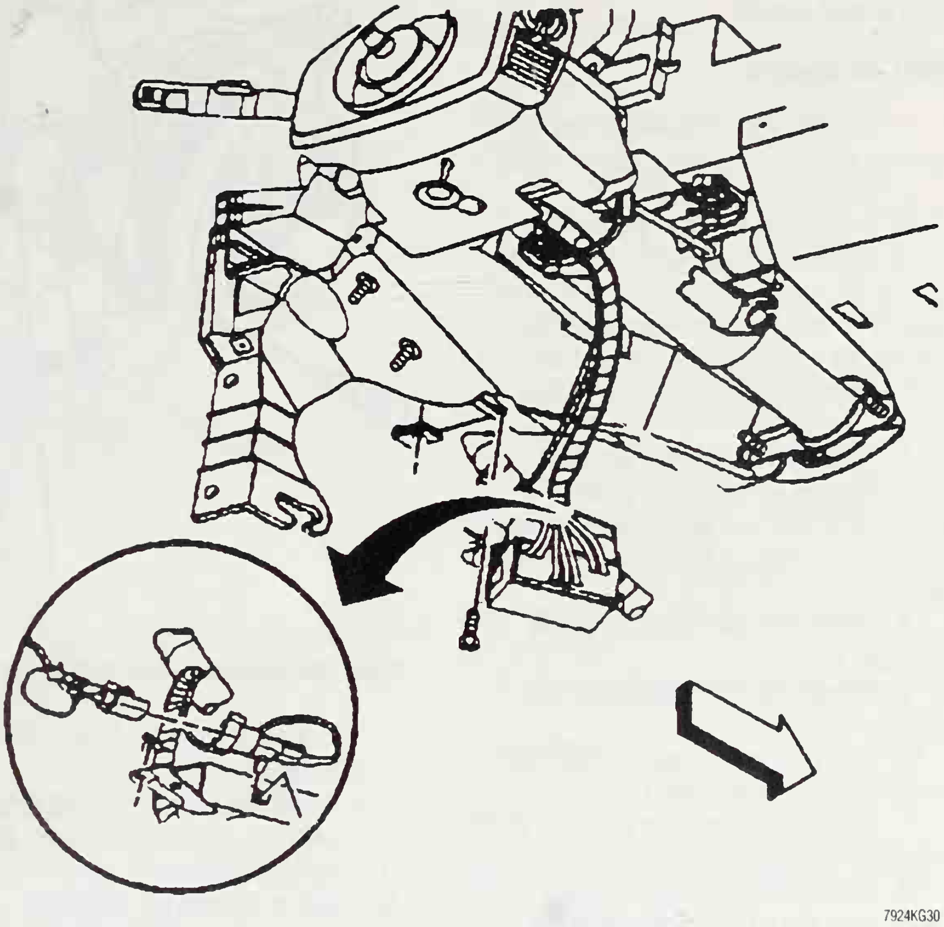
DISARMING & ARMING

2002 Models

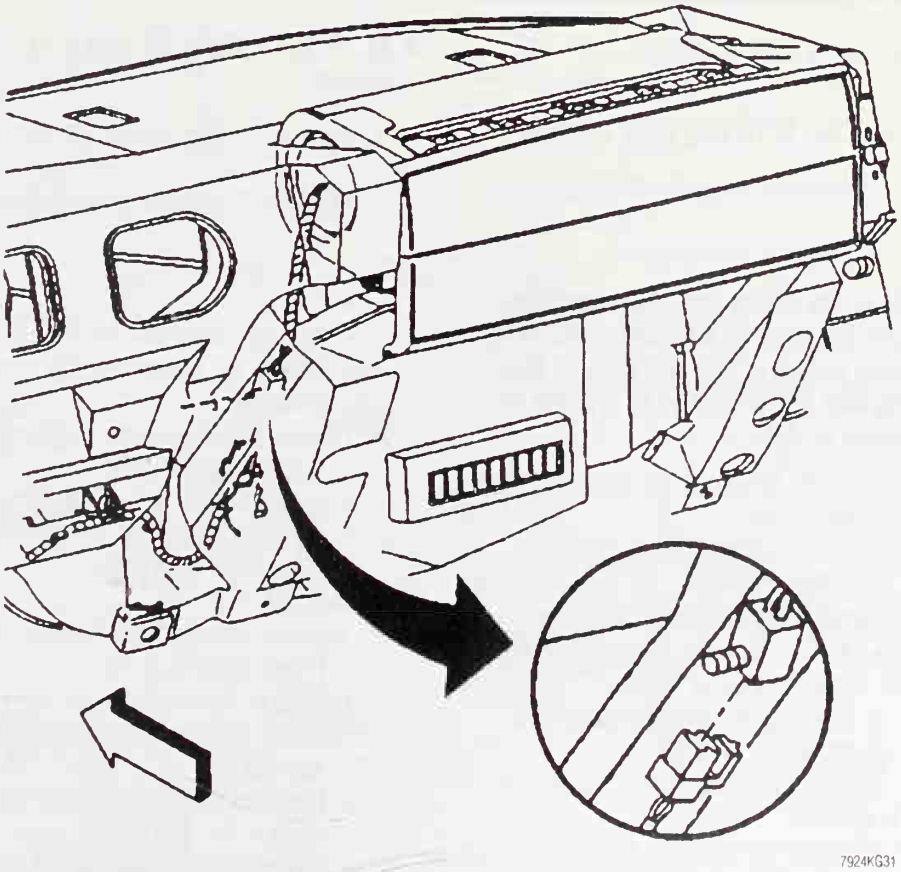
1. Turn the front wheels to the straight-ahead position.
2. Turn the ignition switch to the **LOCK** position and remove the key.

➡If the key is in the RUN position when the Air Bag fuse is removed or open (blown), the Air Bag warning lamp in the dash will light up. This is normal operation, not a sign of a malfunction.

3. Remove the Air Bag fuse from the fuse panel.
4. Remove the drivers side knee bolster and unplug the yellow 2-pin connector at the base of the steering column to disarm the driver's side Air Bag. Remove the passenger side knee bolster and unplug the



Typical air bag connector location—driver's side



Typical air bag connector location—passenger's side yellow 2-pin connector to disable the passenger's side Air Bag.

5. Reverse the procedure to arm the Air Bag restraint system.

2003–06 Models

1. Turn the steering wheel so that the vehicles wheels are pointing straight ahead.
2. Turn OFF the ignition.
3. Remove the key from the ignition.
4. With the SIR fuse removed and the ignition ON, the AIR BAG indicator illuminates. This is normal operation and does not indicate an SIR system malfunction.
5. Remove the SIR fuse from the fuse block.
6. Raise and support the vehicle.
7. Remove the connector position assurance (CPA) from both front end sensor connectors located on the frame crossmember.
8. Disconnect both front end sensor connectors
9. Reverse the procedure to arm the system.
10. When the fuse is installed, turn ON the ignition, with the engine OFF.
11. The AIR BAG indicator will flash 7 times then turn off.
12. Perform the Diagnostic System Check if the AIR BAG indicator does not operate as described.

Power Steering Pump

REMOVAL & INSTALLATION

4.3L, 5.0L, 5.7L and 6.5L Engines

1. Remove or disconnect the following:
    - Hoses at the pump.

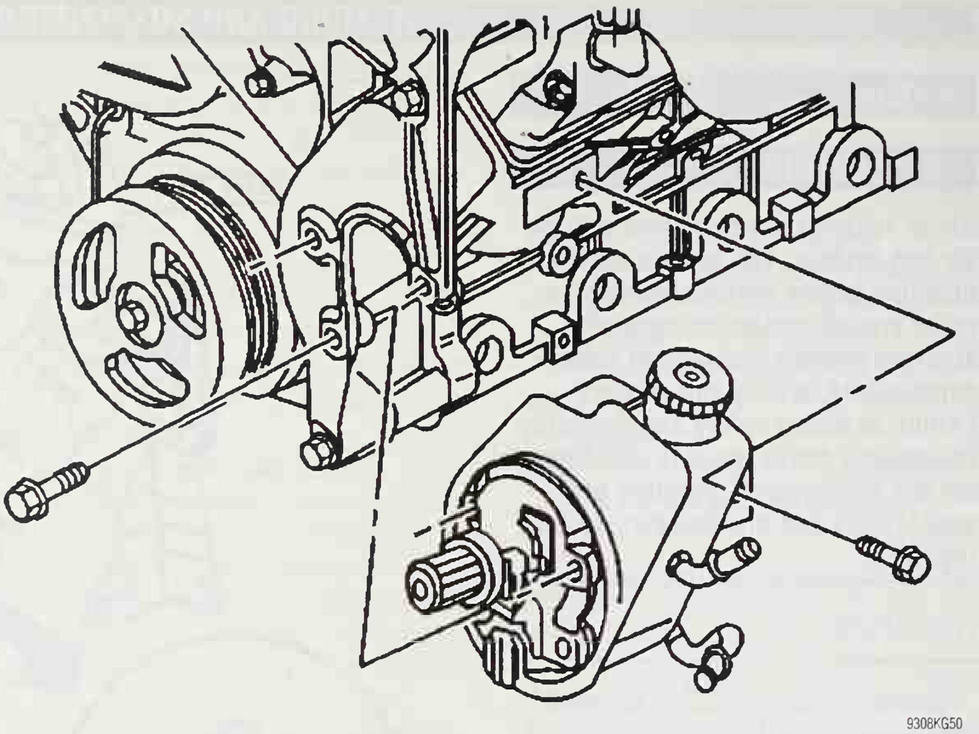
➡When the hoses are disconnected, secure the ends in a raised position to prevent leakage. Cap the ends of the hoses and pump fittings to prevent the entrance of dirt.

- Pump drive belt, by loosening the tensioner
- Pulley with a puller such as J–29785–A

2. Remove the following fasteners:
    - 4.3L, 5.0L and 5.7L engines: front mounting bolts
    - 6.5L diesel: front brace and rear mounting nuts
3. Lift out the pump.

To install:

4. Observe the following torques:
    - 4.3L, 5.0L, and 5.7L engine front mounting bolts: 37 ft. lbs. (50 Nm)
    - 6.5L diesel, front brace: 30 ft. lbs. (40 Nm); rear mounting nuts: 17 ft. lbs. (23 Nm)



Power steering pump—4.8L, 5.3L and 6.0L engines

5. Install or connect the following:
    - Pulley with J–25033–B
    - Drive belt
    - Hoses
6. Fill and bleed the system.

4.8L, 5.3L, 6.0L, 6.6L and 8.1L Engines

1. Remove or disconnect the following:
    - Upper radiator fan shroud, if necessary
    - Drive belt
    - Pulley
    - Nut and clamp retaining the filler neck to the power steering pump, if equipped
2. Place a drain pan under the pump
    - Hoses from the pump
    - Bolts from the rear of the pump
    - Bolts from the front of the pump
    - Pump from the vehicle

To install:

3. Install or connect the following:
    - Power steering pump
    - Bolts to the front and the rear of the pump. Tighten the bolts to 37 ft. lbs. (50 Nm)
    - Hoses to the pump. Tighten the nut to 20 ft. lbs. (28 Nm)
    - Nut and clamp retaining the filler neck to the power steering pump, if equipped
    - Pulley; install with 0.020 in. (0.5mm) play
    - Drive belt
    - Upper radiator shroud
4. Fill and bleed the power steering system.

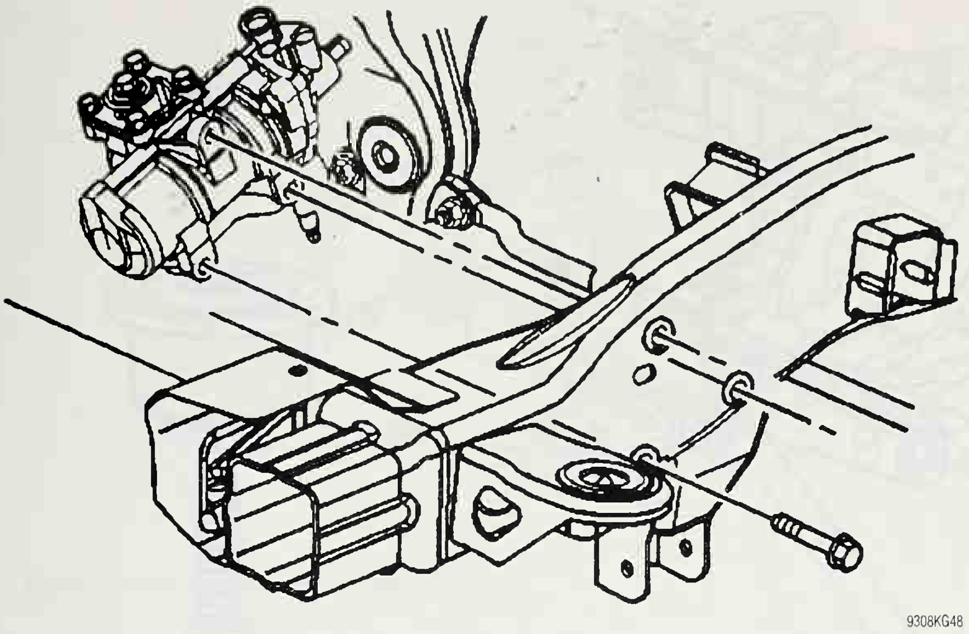
Recirculating Ball Power Steering Gear

REMOVAL & INSTALLATION

1. Raise the vehicle.
2. Remove the shield.
3. Place a drain pan below the steering gear.
4. Remove or disconnect the following:
    - Hoses from the steering gear
    - Intermediate shaft from the steering gear
    - Pitman arm from the relay rod and steering gear
    - Steering gear frame bolts and the steering gear

To install:

5. Place the steering gear in position.
6. Install or connect the following:
    - Steering gear to the frame bolts and tighten to 110 ft. lbs. (150 Nm)
    - Pitman arm to steering gear and tighten to 184 ft. lbs. (250 Nm)
    - Intermediate shaft
7. Remove the plugs and the caps from the steering gear and the hoses.



Recirculating ball steering gear—Silverado shown

- Hoses to the steering gear. Tighten the hose connection to 20 ft. lbs. (28 Nm).
- Shield

8. Fill and bleed the system.
9. Lower the vehicle.

Rack & Pinion Steering Gear

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Remove or disconnect the following:
    - Wheel assemblies
    - Engine shield, if equipped
    - Stabilizer shaft
    - Power steering high and low pressure lines
    - Coupler clamp bolt from the intermediate shaft
    - Outer tie rod ends from steering knuckle
    - Intermediate shaft from the rack and pinion assembly
    - Rack and pinion assembly mounting nuts, washers and bolts
    - Rack and pinion assembly from the vehicle

To install:

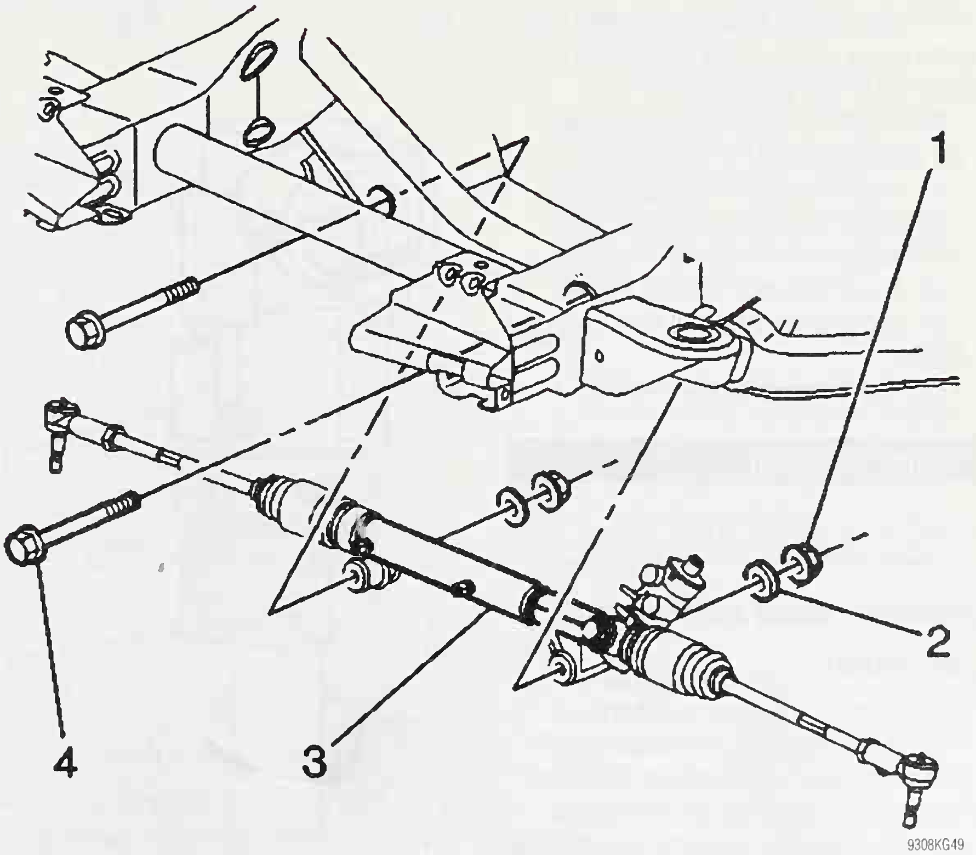
2. Install or connect the following:
    - Rack and pinion assembly into the vehicle
    - Rack and pinion assembly mounting bolts, washers and nuts. Tighten the nuts to 136 ft. lbs. (185 Nm).
    - Intermediate shaft to the rack and pinion assembly
    - Coupler clamp bolt to the intermediate shaft. Tighten the bolt to 33 ft. lbs. (45 Nm).
    - Low pressure hose
    - High pressure hose. Tighten the hoses to 20 ft. lbs. (27 Nm).
    - Outer tie rod ends
    - Engine protection shield, if equipped
    - Stabilizer shaft
    - Wheels
3. Lower the vehicle.
4. Fill and bleed the power steering system.

Express and Savana

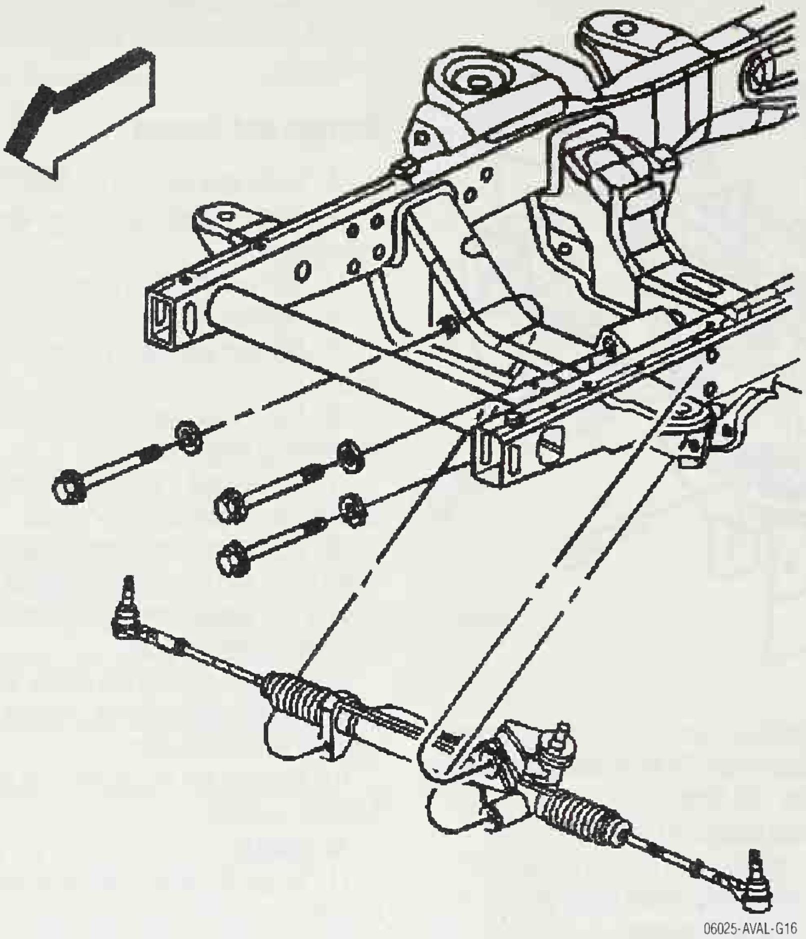
1. Raise and support the vehicle.
2. Place a drain pan under the vehicle.
3. Remove the front tires and wheels.
4. Remove the engine protection shield.
5. Remove the outer tie rods retaining nuts.
6. Disconnect the outer tie rods from the steering knuckles.
7. Disconnect the lower intermediate shaft from the power steering gear.
8. Disconnect the power brake booster outlet hose and power steering gear outlet hose or the power steering cooler hose from the power steering gear.
9. Cap the ends of the hoses and the power steering gear fittings in order to prevent the entrance of dirt.
10. Remove the power steering gear from the vehicle.

To install:

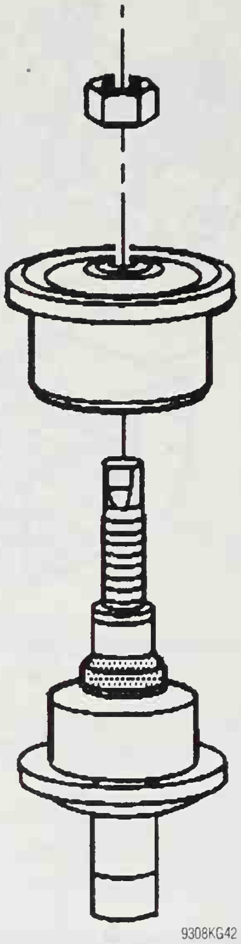
11. Install the power steering gear to the vehicle.
12. Install the power steering gear to the frame mounting bolts and tighten to 110 ft. lbs. (150 Nm).
13. Remove the caps from the steering gear and hoses.



Rack and pinion steering gear—Silverado



Rack and pinion steering gear mounting—Express/Savana



Upper shock insulator—Silverado

14. Connect the power brake booster outlet hose and power steering gear outlet hose or the power steering cooler hose to the power steering gear.

15. Connect the lower intermediate shaft to the power steering gear and tighten the bolt to 45 ft. lbs. (60 Nm).

16. Install the outer tie rods retaining nuts and tighten to 47 ft. lbs. (63 Nm).

17. Install the engine protection shield.

18. Install the front tires and wheels.

19. Lower the vehicle.

20. Bleed the power steering system.

21. Remove the drain pan from under the vehicle.

22. Check the wheel alignment.

Shock Absorber

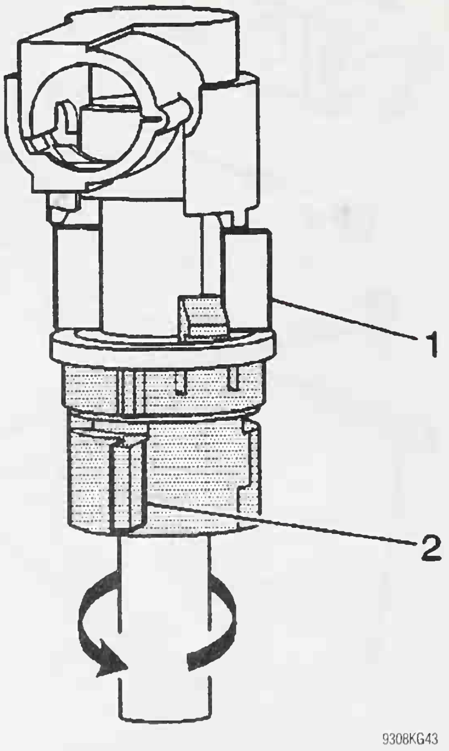
REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

2WD FRONT

1. Raise and support the vehicle.

2. If equipped with selectable ride, disconnect the Real Time Damping (RTD) link rod from the sensor. Grasp the connector lock tabs. Rotate the connector lock tabs (1) and (2) counter-clockwise until the connector is unlocked. Disengage the connector from the tennon by firmly pulling the connector up. Hold the tennon end with a wrench while removing the nut. Remove the nut.



RTD connector—Silverado

3. Remove the upper insulator. Do not discard the plastic pilot ring.

4. Remove the shock absorber mounting bolts at the lower control arm. Remove the shock absorber through the lower control arm from below.

To install:

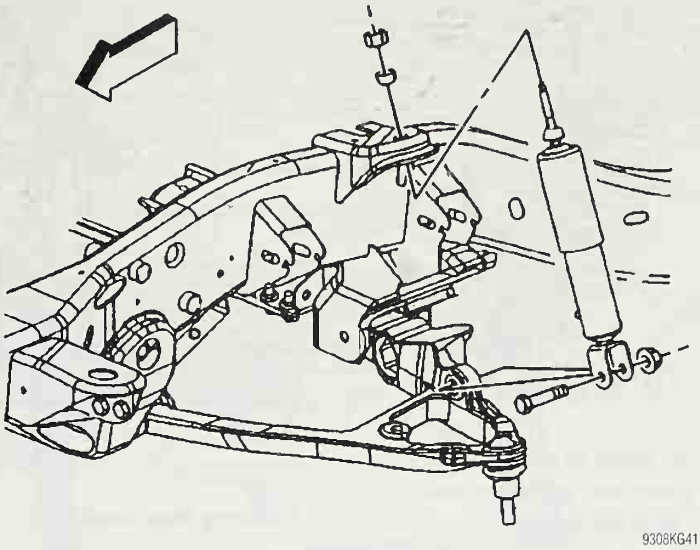
5. Support the lower control arm with a suitable jack in order to align the tennon with the mounting hole if equipped with selectable ride.

6. Install or connect the following:
   - Shock absorber through the lower control arm from below
   - Tennon through the mounting hole in the upper spring pocket

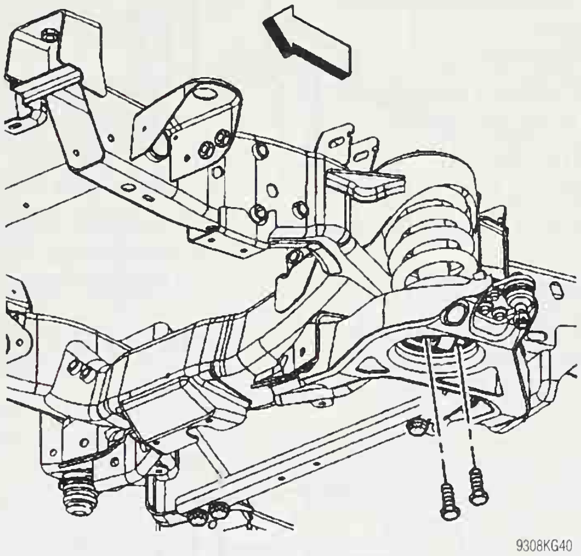
7. Align the shock absorber with the mounting holes in the lower control arm.
   - Shock absorber mounting bolts to the lower control arm. Tighten to 18 ft. lbs. (25 Nm).

➡The upper insulators are substantially larger that the lower insulators. The upper insulator must be installed above the shock mounting bracket on the frame. The plastic pilot ring will assist the alignment of the isolators.

   - Upper insulator to the shock absorber



Shock absorber removal—4WD Silverado



Shock absorber removal—2WD Silverado

- Nut to the tennon end. Do not tighten the nut.
- RTD link rod to the sensor (if equipped).

8. Remove the safety stands.

9. Lower the vehicle. Hold the tennon end with a wrench while torquing the nut. Tighten the nut to 15 ft. lbs. (20 Nm).

10. Connect the electrical connector using the following procedure:

a. Verify that the connector is unlocked.

b. Align the connector so that the tabs are perpendicular to the wrench flats on the tennon end.

c. Engage the connector to the tennon by firmly pushing the connector down.

d. Grasp the connector lock tabs. Rotate the connector counter clockwise.

11. The connector is locked into place when you hear an audible snap and the tabs are aligned.

4WD FRONT

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Real Time Damping (RTD) link rod from the sensor, if equipped
   - Electrical connector, if equipped with selectable ride. Grasp the connector lock tabs. Rotate the connector tabs counter clockwise until the connector is unlocked. Disengage the connector from the tennon by firmly pulling the connector up. Hold the tennon end with a wrench while removing the nut. Remove the nut.
   - Upper insulator. Do not discard the plastic pilot ring.
   - Shock absorber mounting bolt at the lower control arm

➡The lower shock mounting bushing is serviceable by driving the bushing out with the appropriate tool.

- Shock absorber

To install:

3. Install the shock absorber. Insert the stem through the hole in the shock bracket on the frame. Align the shock absorber with the mounting holes in the lower control arm.

4. Install or connect the following:
   - Shock absorber through bolt to the lower control arm
   - Shock absorber through bolt nut and tighten to 59 ft. lbs. (80 Nm)

➡The upper insulators are substantially larger that the lower insulators. The upper insulator must be installed above the shock mounting bracket on the frame. The plastic pilot ring will assist the alignment of the isolators.

- Upper insulator to the shock absorber
- Nut to the tennon end. Do not tighten the nut
- RTD link rod to the sensor, if equipped

5. Remove the safety stands. Lower the vehicle. Hold the tennon end with a wrench while torquing the nut. Tighten the nut to 15 ft. lbs. (20 Nm).

6. Connect the electrical connector using the following procedure if equipped with selectable ride.

a. Verify that the connector is unlocked.

b. Align the connector so that the tabs (1) are perpendicular to the wrench flats on the tennon end.

c. Engage the connector to the tennon by firmly pushing the connector down.

d. Grasp the connector lock tabs (1, 2). Rotate the connector counter clockwise. The connector is locked into place when you hear an audible snap and the tabs are aligned.

REAR

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Electrical connector, if equipped with selectable ride
   - Upper shock absorber nut and bolt
   - Lower shock absorber nut and bolt
   - Shock absorber

To install:

3. Installation is the reverse of removal. Tighten the nuts to 70 ft. lbs. (95 Nm).

4. Connect the electrical connector if equipped with Selectable Ride. Remove the safety stands. Lower the vehicle.

Express and Savana

FRONT

1. Support the front of the vehicle safely under the lower control arms.
2. Remove or disconnect the following:
   - Tire and wheel assembly
   - Upper and lower shock absorber retaining fastener(s)

➡Vehicles equipped with quad shocks have a spacer between them.

   - Shock absorber

To install:

3. Install or connect the following:
   - Shock absorber and fastener(s)
4. On 2-wheel drive vehicles torque the upper bolt to 15 ft. lbs. (20 Nm) and the lower bolts to 18 ft. lbs. (25 Nm). On 4-wheel drive vehicles, torque the lower bolt to 59 ft. lbs. (80 Nm). and the upper bolt to 15 ft. lbs. (26 Nm). Be sure the bolts are inserted in the proper direction. The upper bolt head should be forward; the bottom bolt head should be rearward.
   - Tire and wheel

REAR

1. The vehicle's weight should rest on correctly placed safety stands located under the frame. Chock the front wheels to prevent vehicle movement.
2. Support the rear axle with a floor jack.
3. If the vehicle is equipped with air lift type shocks, bleed the air from the lines and disconnect the line from the shock absorber.
4. Remove or disconnect the following:
   - Shock absorber at the top by removing the 2 mounting bolts/nuts from the frame bracket
   - Nut, washers and bolt from the bottom mount
   - Shock

To install:

5. Install or connect the following:
   - Shock
   - Upper mounting nuts/bolts and tighten to 18 ft lbs. (25 Nm).
   - Lower mounting bolt/nuts and tighten to 60 ft lbs. (80 Nm).
6. Check that no parts such as exhaust components bind on the shock absorbers.

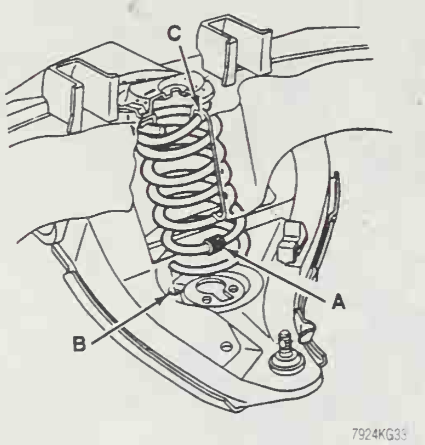
Coil Springs

REMOVAL & INSTALLATION

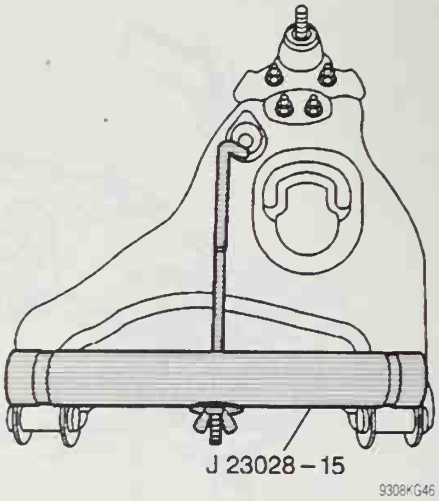
Avalanche, Sierra and Silverado

FRONT

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Engine protection shield
   - Frame cross bar (25 series only)
   - Tire and wheel assembly
   - Shock absorber
   - Front stabilizer shaft link
3. Install tool J23028-15 using the outboard locating tab (15 Series), or, the inboard locating tab (25 Series).
4. Attach the retaining hook to the control arm. Tighten the wing nut until free-play is eliminated.
5. Securely attach tool J23028-01 to a suitable transmission jack. Raise the jack until the yokes of tool J23028-01 line up with the notches in J23028-15.

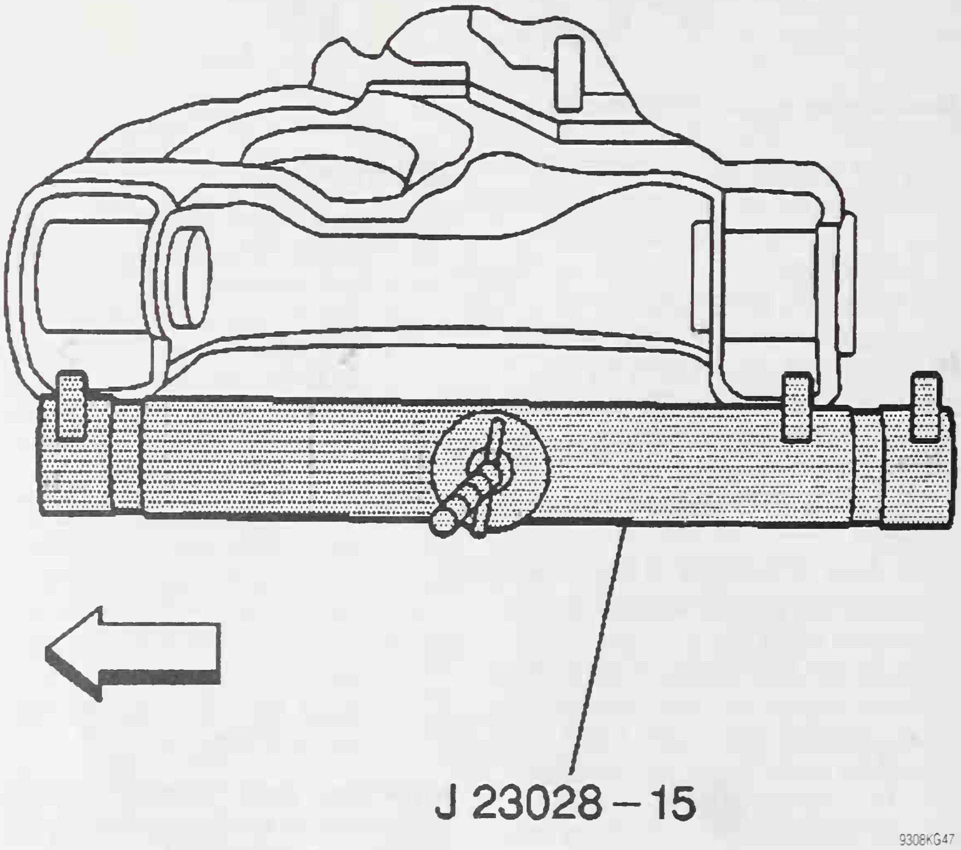


Position the coil spring so the bottom end of the spring covers only one drain hole—the other hole must remain open

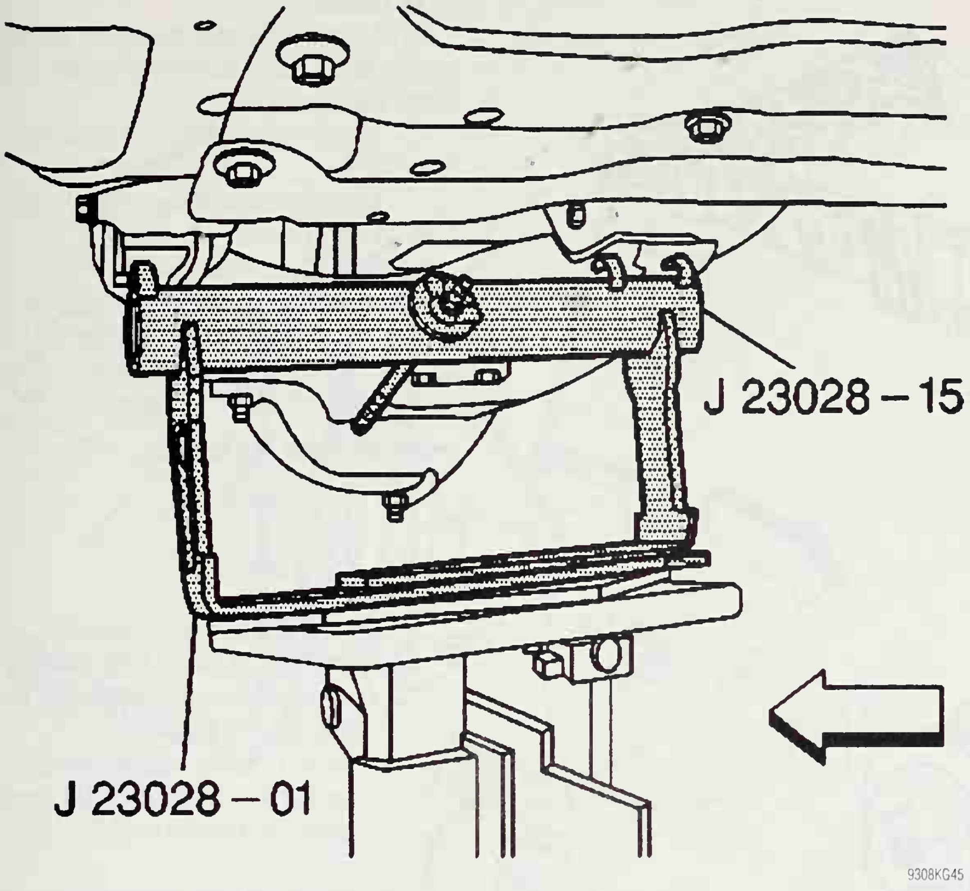


Retaining hook installation

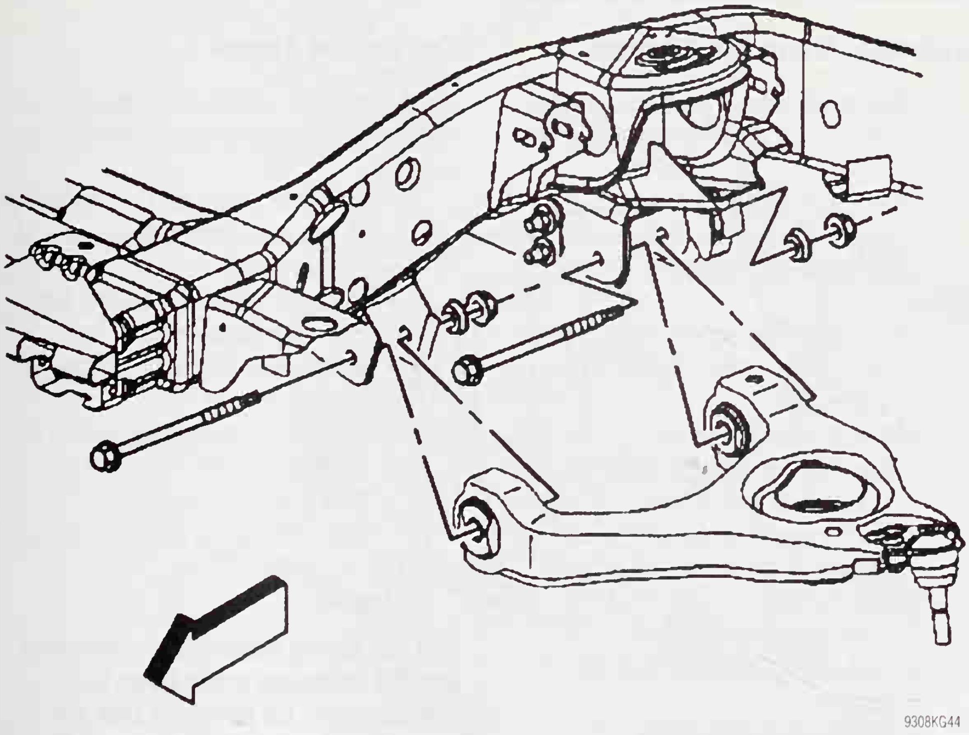
6. Using the tools and the transmission jack, relieve the spring tension from the lower control arm pivot bolts.
7. Remove or disconnect the following:
   - Lower control arm pivot bolt nuts
   - Rear pivot bolt
   - Front pivot bolt
8. Slowly lower the transmission jack in order to unload the front coil spring. It may be necessary to use a pry bar in order to guide the lower control arm out of position.
9. Remove the coil spring and the insulator.



Installing J23028-15 on the 25 Series



Tool attached to a jack



Lower control arm removal—Silverado

To install:

10. Install the coil spring and the insulator to the lower control arm.

11. Raise the transmission jack in order to compress the front coil spring. It may be necessary to use a pry bar in order to guide the lower control arm into position.

12. Install or connect the following:

- Front pivot bolt
- Rear pivot bolt
- Lower control arm pivot nuts. Tighten the pivot bolt nuts to 107 ft. lbs. (145 Nm).

13. Lower the jack. Remove the tool from the control arm.

- Front stabilizer shaft link
- Shock absorber
- Tire and wheel assembly
- Frame cross bar (25 series only). Tighten the nuts to 74 ft. lbs. (100 Nm).

14. Install the engine protection shield.

15. Remove the safety stands. Lower the vehicle.

REAR

1. Raise and support the vehicle.

2. Disconnect the Real Time Damping (RTD) sensor, if equipped.

3. Remove the lower shock absorber nuts and bolt from the rear axle.

4. Lower the rear axle until the springs are fully unloaded.

5. Remove the spring and the upper and lower insulators.

To install:

6. Position the spring and the upper and lower insulators.

7. Install the rear spring to the rear axle.

8. Raise the rear axle. Install the lower shock absorber nuts to the rear axle.

9. Connect the RTD sensor, if equipped.

10. Remove the rear axle support. Lower the vehicle.

Express and Savana

1. Support the vehicle safely under the frame rails. The control arms should hang freely.

2. Remove or disconnect the following:

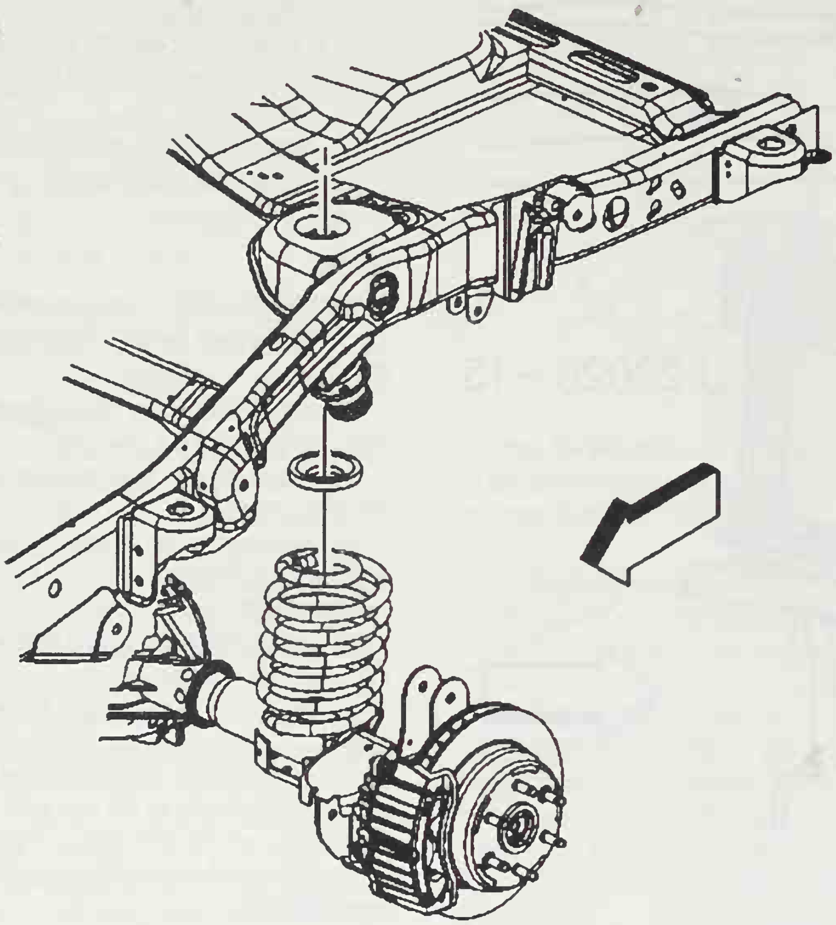
- Wheel
- Shock absorber lower end mounting nut/bolt
- Stabilizer bar from the lower control arm

3. Support the lower control arm and install a spring compressor on the spring or chain the spring to the control arm as a safety precaution.

➡If equipped with an air cylinder inside the spring, remove the valve core from the cylinder and expel the air by compressing the cylinder with a pry-bar. With the cylinder compressed, replace the valve core so the cylinder will stay in the compressed position. Push the cylinder as far as possible towards the top of the spring.

4. Raise the front end to remove the tension from the lower control arm the bolts securing the control arm.

➡The cross-shaft and lower control arm keeps the coil spring compressed. Use care when lowering the assembly.



Rear coil spring removal—15 Series Silverado

5. Slowly lower the control arm until the spring can be removed. Be sure all compression is relieved from the spring.
6. If the coil spring was chained, remove the chain and spring. If a compressor was used, remove the spring and slowly release the compressor.
7. Remove the air cylinder, if equipped.

To install:

8. Install or connect the following:
    - Air cylinder so the protector plate is toward the upper control arm. The Schrader valve should protrude through the hole in the lower control arm.
    - Chain and spring or compress the spring and install the assembly
9. Slowly raise the control arm.
    - Bolts securing the control arm. Tighten to 107 ft. lbs. (145 Nm).
    - Stabilizer bar to the lower control arm. Torque the nuts to 24 ft. lbs. (34 Nm).
    - Shock absorber at the lower end. Torque the nuts to 37 ft. lbs. (50 Nm).
    - Air cylinders, inflate the cylinder to 60 psi (414 kpa) if equipped
    - Wheel
10. Once the weight of the vehicle is on the wheels, reduce the air cylinder pressure to 50 psi.

Leaf Springs

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Before servicing the vehicle, refer to the precautions in the beginning of this section.
2. Raise and support the vehicle.
3. Support the rear axle independently in order to relieve the tension on the leaf springs.
4. Remove or disconnect the following:
    - Real Time Damping (RTD) sensors, if equipped
    - Trailer hitch if equipped
    - Fuel tank for left side applications
    - U-bolt nuts and U-bolts
    - Spring spacer and anchor plate
    - Shackle to the frame bracket nut and the bolt
    - Front spring bracket bolt
    - Leaf spring assembly from the vehicle
    - Shackle from the spring

To install:

5. Loosely assemble the spring shackle bracket to the frame. Install the shackle bolt. Install the shackle nut.
6. Install the leaf spring assembly to the vehicle.
7. Loosely assemble the spring to the front hanger bracket.
8. Install or connect the following:
    - Front spring hanger bracket bolt
    - Front spring hanger bracket nut
    - Shackle to the spring bolt
    - Shackle to the spring nut

➡Do not reuse the U-bolts.

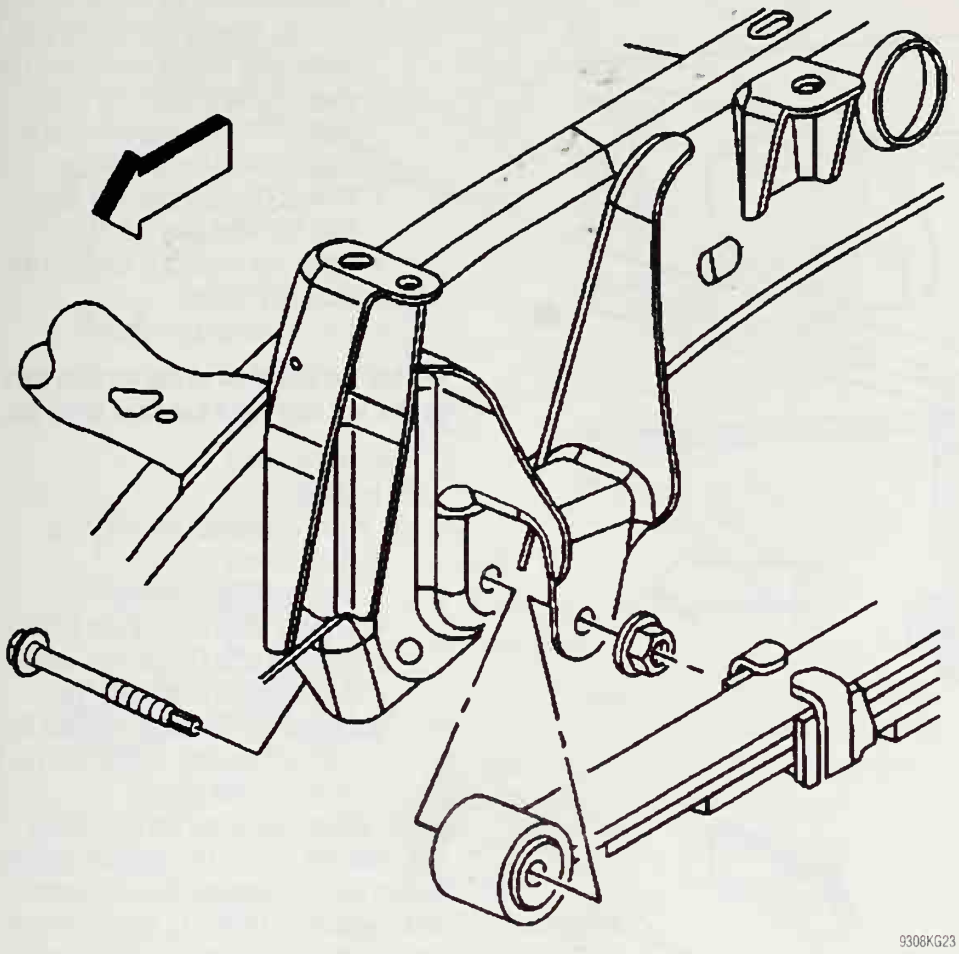
    - Spring spacer
    - U-bolts
    - Anchor plate
    - U-bolt nuts
9. Observe the following torques:
    - For 15 series without rear wheel steering tighten the U-bolt nuts to 53 ft. lbs. (72 Nm)
    - For all 15 series with rear wheel steering and 15HD/25/35/36 series tighten the U-bolts to 110 ft. lbs. (150 Nm)
    - Tighten the front hanger bracket nut to 110 ft. lbs. (150 Nm)
    - Tighten the rear hanger bracket nut to 70 ft. lbs. (95 Nm)
10. Install the fuel tank for left side applications.
11. Install the trailer hitch if equipped.
12. Connect the RTD sensors, if equipped
13. Remove the rear axle support.
14. Remove the safety stands. Lower the vehicle.

Express and Savana

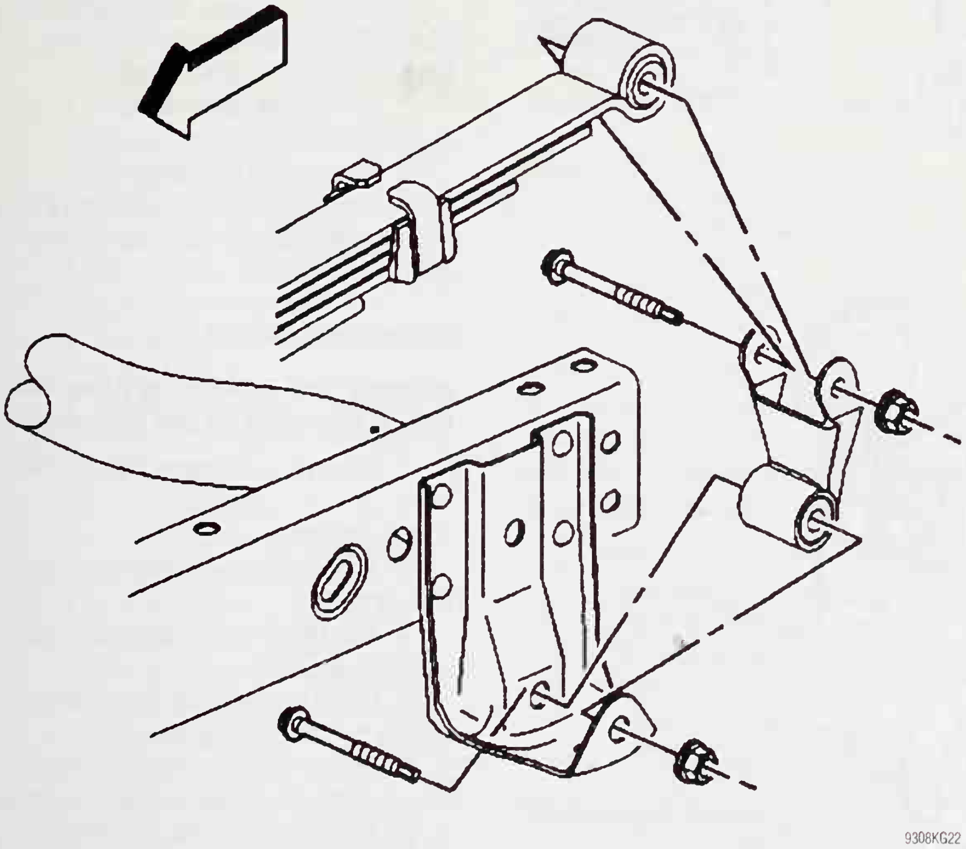
1. Raise the vehicle and support it so that there is no tension on the leaf spring assembly.
2. Remove or disconnect the following:
    - U-bolt nuts, plates, and spacer(s)
    - Anchor plate
    - Spring-to-shackle retaining bolts. (Do not remove these bolts)
    - Bolts which attach the shackle to the rear bracket
    - Bolt which attaches the spring to the front bracket
    - Spring from the vehicle
3. Inspect the spring and replace any damaged components.

To install:

➡If the spring bushings are defective, use the following procedures for replacement. On bushings that are staked in place, the stakes must first



Rear leaf spring front shackle—Silverado



Rear leaf spring rear shackle—Silverado

be straightened. Using a press or vise, remove the bushing and install the new one. When a new, previously staked bushing is installed, stake it in 3 equally spaced locations.

4. Place the spring assembly onto the axle housing. Position the front and rear of the spring at the brackets. Raise the axle with a floor jack as necessary to make the alignments.
5. Install or connect the following:
   - Front and rear brackets bolts loosely
   - Spacers and spring plate
   - New u-bolts, washers and nuts
   - Anchor plate
6. Install the leaf spring U-bolt nuts. Tighten the leaf spring U-bolt mounting nuts to 63 ft. lbs. (85 Nm) on 1500 models, 103–108 ft. lbs. (140–147 Nm) on 2500 Series and 3500 Series Cargo and Passenger Vans and Cutaways.
7. Check that the hanger and shackle bolts are properly installed. All bolt heads should be inboard. Don't tighten them yet.
8. Using the floor jack, raise the axle until the distance between the bottom of the rebound bumper and its contact point on the axle is 182mm plus or minus 6mm.
9. When the spring is properly positioned, tighten all the hanger and shackle nuts to 70 ft. lbs. (95 Nm).
10. Tighten the following:
    - Leaf spring-to-shackle nuts 15/25/35 series: 70 ft. lbs. (95 Nm)
    - Leaf spring-to-shackle nuts C3HD series: 157 ft. lbs. (213 Nm)
    - Shackle-to-bracket nuts C3HD series: 157 ft. lbs. (213 Nm)

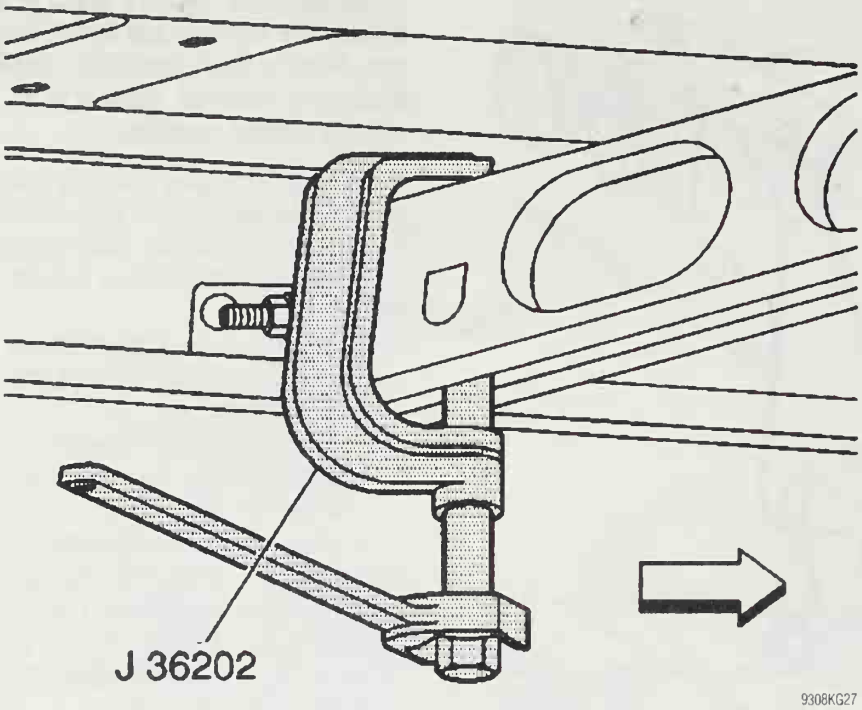
Torsion Bars

REMOVAL & INSTALLATION

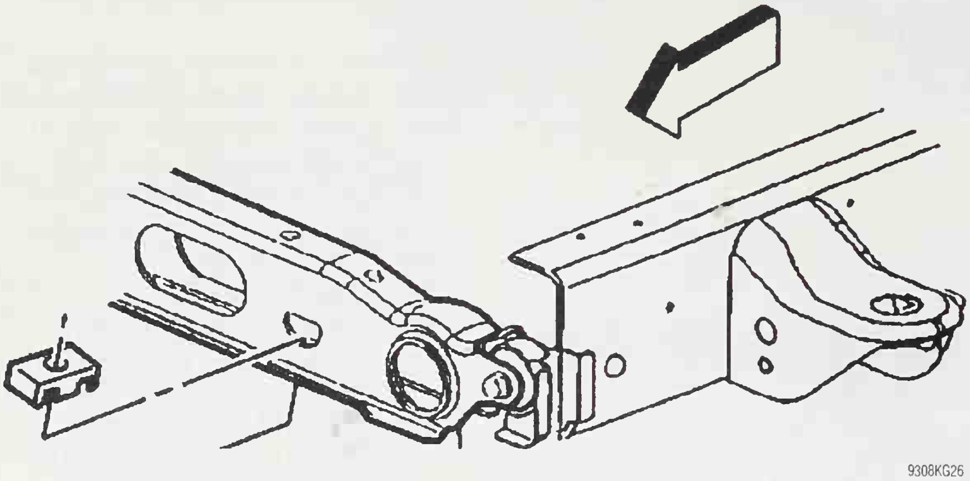
Avalanche, Sierra and Silverado

➡This procedure requires the removal of both torsion bars.

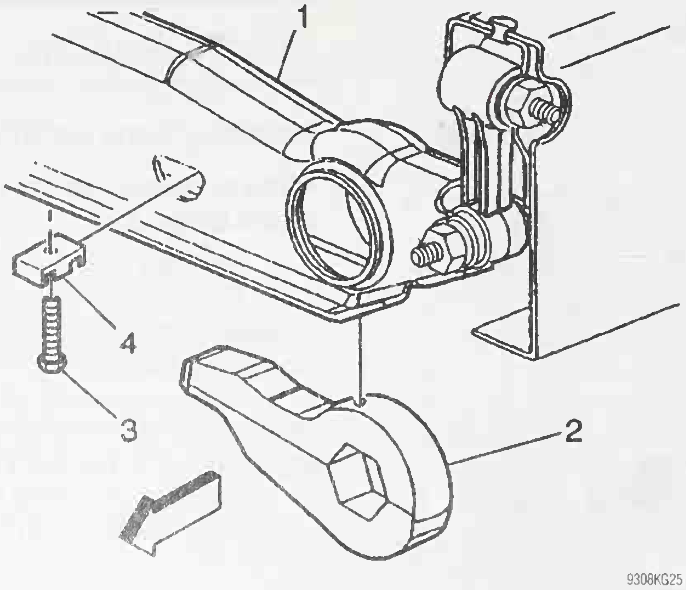
1. Raise and support the vehicle.
2. Mark the adjustment bolt setting. Install tool J36202 to the adjustment arm and the crossmember.
3. Increase the tension on the adjustment arm until the load is removed from the adjustment bolt and the adjuster nut.
4. Remove or disconnect the following:
   - Adjustment bolt and the adjuster nut
   - Tool, allowing the torsion bar to unload.



Retainer installation—Silverado torsion bar



Adjuster nut removal—15 Series Silverado



Adjuster bolt removal—15 Series Silverado

- Adjustment arm by sliding the torsion bar forward until the torsion bar clears the adjustment arm. Use your hand to support the adjustment arm as the adjustment arm releases from the torsion bar.
- Torsion bar crossmember bolts from the weld nuts (15 Series)
- Upper link mounting nuts and the bolts (25 Series)
- Torsion bar crossmember

➡Note the position of the torsion bars as the left and right bars are different.

- Torsion bars

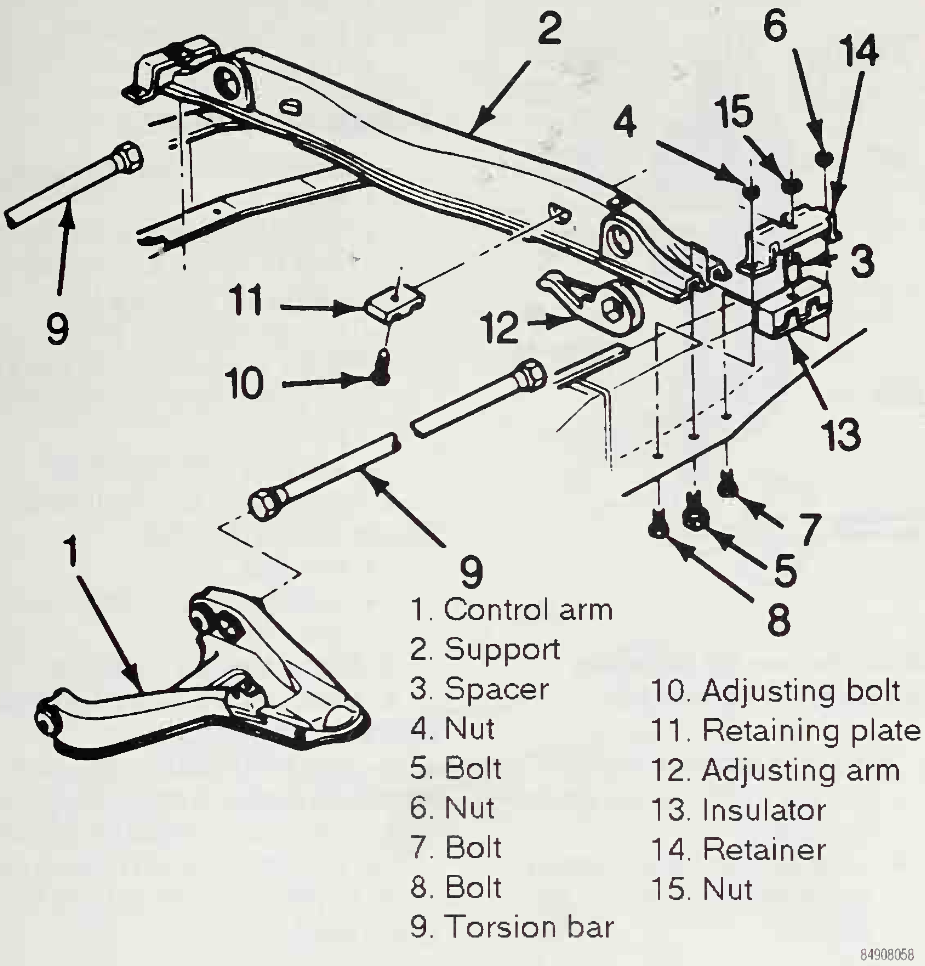
To install:

5. Install or connect the following:
   - Torsion bars
   - Torsion bar crossmember
   - Torsion bar crossmember bolts to the weld nuts (15 Series). Tighten the bolt to 70 ft. lbs. (95 Nm)
   - Upper link mounting nuts and the bolts (25 Series). Tighten the nut to 70 ft. lbs. (95 Nm)
6. While supporting the adjustment arm, slide the torsion bar rearward until the torsion bar fully engages the adjustment arm. Install tool J36202 to the adjustment arm and the crossmember. Increase the tension on the adjustment arm in order to load the torsion bar.
   - Adjustment bolt and the adjuster nut
7. Remove the tool, releasing the tension on the torsion bar until the load is taken up by the adjustment bolt.
8. Remove the safety stands.
9. Lower the vehicle.
10. Measure the ride height.
11. Turn the adjustment bolt clockwise to increase the ride height and counterclockwise to decrease it.

Express and Savana

➡Special tool J–36202, or its equivalent, is necessary for this procedure.

1. Remove or disconnect the following:
   - Wheels
2. Support the lower control arm with a floor jack.
3. Matchmark both torsion bar adjustment bolt positions.
4. Using tool J–36202, increase the tension on the adjusting arm.
5. Remove or disconnect the following:
   - Adjustment bolt and retaining plate
6. Move the tool aside, and slide the torsion bars forward.
   - Adjusting arms



1. Control arm
2. Support
3. Spacer
4. Nut
5. Bolt
6. Nut
7. Bolt
8. Bolt
9. Torsion bar
10. Adjusting bolt
11. Retaining plate
12. Adjusting arm
13. Insulator
14. Retainer
15. Nut

Installing the torsion bar—K-Series

- Torsion bar support crossmember and slide the support crossmember rearwards
- Torsion bars, matchmark the position. They are not interchangeable.
- Support crossmember
- Retainer, spacer and bushing from the support crossmember

To install:

7. Install or connect the following:
   - Retainer, spacer and bushing to the support crossmember
   - Support assembly on the frame, out of the way
   - Torsion bars, sliding them forward until they are supported. Align the marks made when removed.
   - Support crossmember into position. Torque the bolts to 70 ft. lbs. (95 Nm).
   - Adjuster retaining plate and bolt on each torsion bar

8. Using tool J–36202, increase tension on both torsion bars.

9. Set the adjustment bolt to the marked position.

10. Release the tension on the torsion bar until the load is taken up by the adjustment bolt.

11. Install both wheels

Upper Ball Joint

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Tire and wheel assembly
   - Upper control arm
   - Upper ball joint, using a press

To install:

➡The ball joint must be installed with the flat edges or notches in the same position as the replaced ball joint. The ball joint is directional and damage will occur if this procedure is not followed.

3. Install or connect the following:
   - Upper ball joint, using a press
   - Upper control arm
   - Tire and wheel assembly
4. Remove the safety stands.
5. Lower the vehicle.
6. Verify the wheel alignment.

Express and Savana

1. Remove or disconnect the following:
   - Wheel
   - Brake hose bracket from the control arm
2. Using a ⅛ in. drill bit, drill a pilot hole through each ball joint rivet.
3. Drill out the rivets with a ½ in. drill bit. Punch out any remaining rivet material.
   - Cotter pin and nut from the ball stud
4. Support the lower control arm.
   - Stud from the knuckle, using a ball joint separator

To install:

5. Install or connect the following:
   - New ball joint on the control arm

➡Service replacement ball joints come with nuts and bolts to replace the rivets.

   - Bolts and nuts. Torque the nuts to 17 ft. lbs. (23 Nm) for 15- and 25-Series, 52 ft. lbs. (70 Nm) for 35-Series.

➡The bolts are inserted from the bottom.

6. Start the ball stud into the knuckle. Ensure it is squarely seated. Install the ball stud nut and pull the ball stud into the knuckle with the nut. Tighten the nut after the vehicle wheels are on the ground and the suspension is loaded.
7. Install the wheel.
8. Once the weight of the vehicle is on the wheels tighten the nut to 84 ft. lbs. (115 Nm).

Lower Ball Joint

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

2WD MODELS

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Tire and wheel assembly
   - Front coil spring
   - Lower control arm
3. Secure the lower control arm in a bench vise or equivalent.
4. Center punch the rivet heads.
5. Drill out the rivets.

To install:

6. Install or connect the following:
   - Ball joint to the lower control arm
   - Replacement bolts to the lower control arm
   - Nuts to the bolts. Tighten the nuts to 52 ft. lbs. (70 Nm).
7. Remove the lower control arm from the bench vise.

- Lower control arm
- Coil spring
- Tire and wheel tire assembly

8. Remove the safety stands.
9. Lower the vehicle.
10. Verify the wheel alignment.

4WD MODELS

1. Raise and support the vehicle.
2. Remove or disconnect the following:
    - Tire and wheel assembly
    - Lower control arm
3. Place the lower control arm in a bench vise.
4. Using a chisel, remove the 4 securing crimps from the ball joint body (15 series only).
5. Using a press, remove the ball joint from the lower control arm.

To install:

➡Use the outer flange of the ball joint in order to press the ball joint into place.

6. Install the new ball joint using a press.
7. Place the lower control arm in a bench vise.
8. Using a punch, install 4 crimps to the ball joint. Use the replaced ball joint as a reference (15 series only).
9. Install or connect the following:
    - Lower control arm
    - Tire and wheel assembly
10. Remove the safety stands.
11. Lower the vehicle.
12. Verify the wheel alignment.

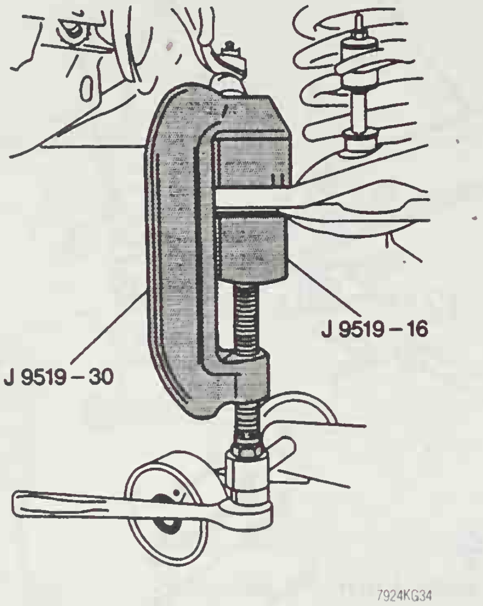
Express and Savana

2-WHEEL DRIVE MODELS

1. Place jack under lower control arm, then raise the jack slightly.
2. Remove or disconnect the following:
    - Tire and wheel assembly
    - Brake caliper and position it to the side
    - Coil spring
    - Cotter pin and the lower ball joint retaining nut. Using the proper tool separate the ball joint from its mounting. Support the knuckle assembly so its weight will not damage the brake hose.
    - Ball joint out of the lower control arm, using tool J-9519-30-D or equivalent.

To install:

3. Start the new ball joint into the control arm. Position the bleed vent in the rubber boot facing inward.

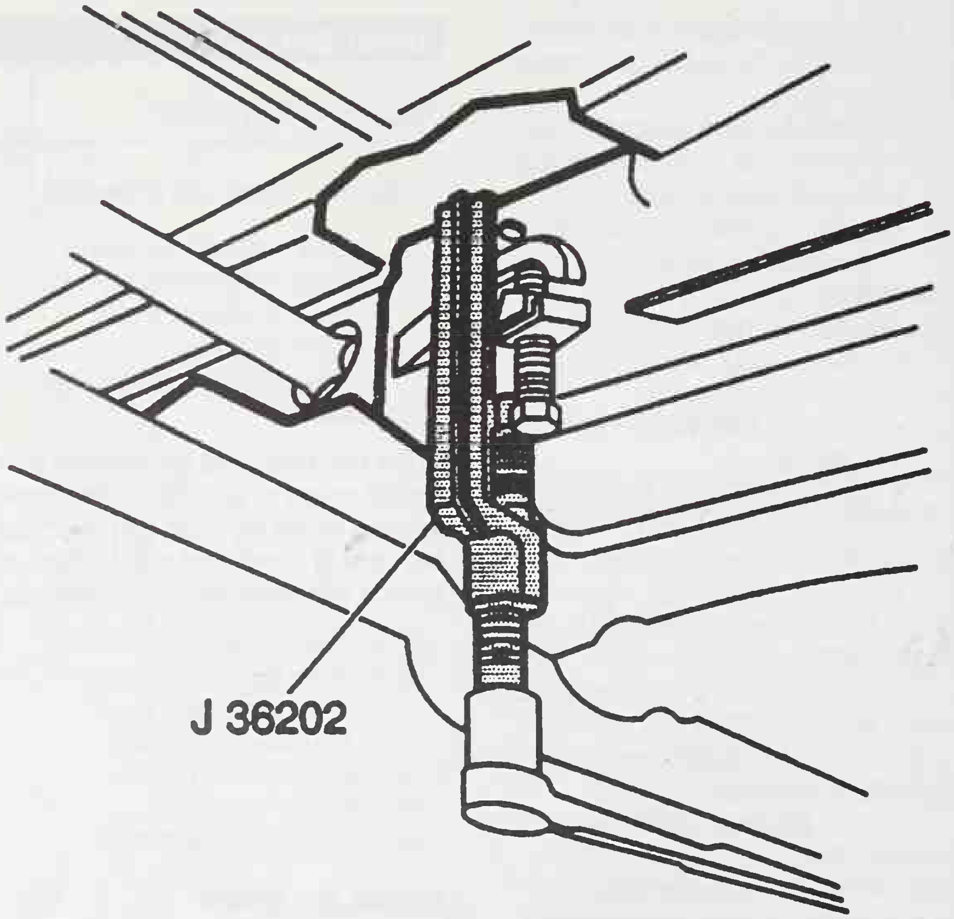


Installing the lower ball joint into the lower control arm—2-wheel drive

4. Install or connect the following:
    - Ball joint into the control arm until fully seated
    - Lower ball joint into the steering knuckle and tighten to 74 ft. lbs. (100 Nm)
    - Coil spring
    - Brake caliper, if removed
    - Tire and wheel

4-WHEEL DRIVE MODELS

1. Remove or disconnect the following:
    - Wheel
    - Splash shield from the knuckle
    - Inner tie rod end from the relay rod using a ball joint separator
    - Hub nut and washer. Insert a long drift or dowel through the vanes in the brake rotor to hold the rotor in place.
    - Axle shaft inner flange bolts
2. Using a puller, force the outer end of the axle shaft out of the hub.
    - Axle shaft
    - Cotter pin and nut from the ball stud
3. Support the lower control arm.
4. Matchmark both torsion bar adjustment bolt positions.
5. Using tool J-36202 or equivalent, increase the tension on the adjusting arm.
6. Remove or disconnect the following:
    - Adjustment bolt and retaining plate
7. Move the tool aside and slide the torsion bars forward.



A special tool is available for removing or installing the torsion bar adjusting bolt—4-wheel drive

- Ball joint from the knuckle, using a screw-type forcing tool
- Lower control arm
- Lower ball joint out of control arm with tool J-9519-E or equivalent ball joint press

To install:

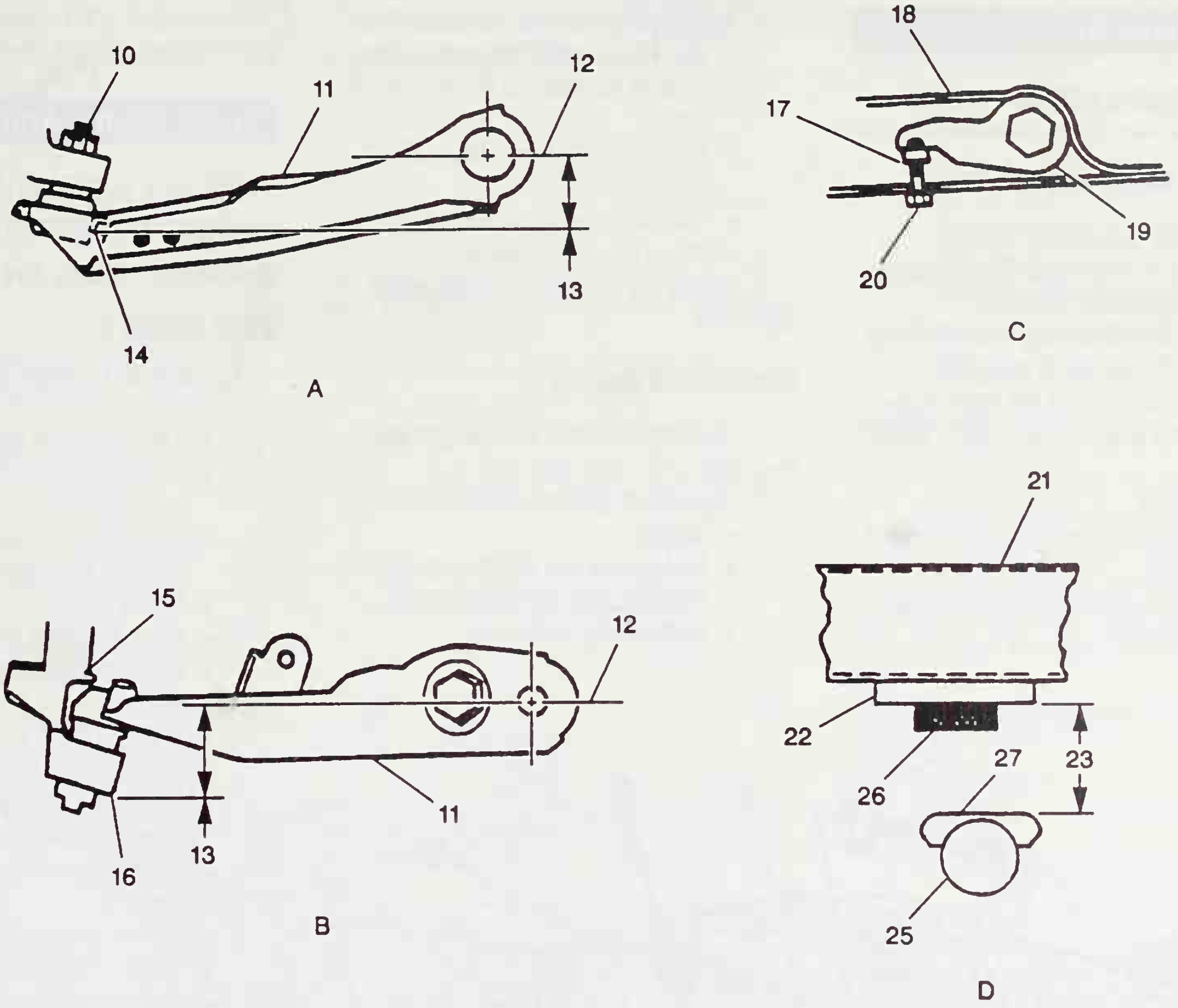
8. Install or connect the following:
   - New ball joint into the control arm with tool J-9519-E or equivalent
   - Lower control arm

9. Using tool J-36202 or equivalent, increase tension on both torsion bars.
   - Adjustment retainer plate and bolt on both torsion bars

10. Set the adjustment bolt to the marked position.

11. Release the tension on the torsion bar until the load is take up by the adjustment bolt and remove the tool.
   - Shaft in the hub and the washer and hub nut. Leave the drift in the rotor vanes and torque the hub nut to 175 ft. lbs. (238 Nm).
   - Flange bolts. Tighten them to 59 ft. lbs. (80 Nm), remove the drift.
   - Inner tie rod end at the steering relay rod. Torque the nut to 35 ft. lbs. (48 Nm).
   - Splash shield
   - Wheel

12. Once the weight of the vehicle is on the wheels follow these steps:
   a. Lift the front bumper about 1 ½ in. (38mm) and let it drop.
   b. Repeat this procedure 2–3 more times.
   c. Draw a line on the side of the lower control arm from the centerline of the control arm pivot shaft, dead level to the outer end of the control arm.
   d. Measure the distance between the lowest corner of the steering knuckle and the line on the control arm, record the figure.



A. "C" MODEL
B. "K" MODEL
C. "K" MODEL TORSION BAR ADJUSTER
D. "CK" MODEL REAR SUSPENSION
10. LOWER BALL JOINT
11. LOWER CONTROL ARM
12. PIVOT BOLT CENTER LINE
13. "Z" HEIGHT
C 1,2,3 95.0 ± 6.0mm
K 1,2 157.0 ± 6.0mm
K 3 145.0 ± 6.0mm
14. LOWER BALL JOINT EXTRUSION
15. STEERING KNUCKLE
16. STEERING KNUCKLE LOWER CORNER
17. NUT
18. TORSION BAR SUPPORT ASM.
19. TORSION BAR ADJUSTMENT ARM
20. BOLT – ONE TURN EQUALS 6mm HEIGHT CHANGE
21. FRAME
22. BOTTOM SURFACE OF JOUNCE BRACKET
23. "D" HEIGHT
25. REAR AXLE
26. JOUNCE BUMPER
27. AXLE JOUNCE PAD

Use these specifications and diagrams to determine if the vehicle ride height is correct

e. Push down about 1½ in. (38mm) on the front bumper and let it return. Repeat the procedure 2–3 more times.

f. Re-measure the distance at the control arm.

g. Determine the average of the 2 measurements. This is the "Z" height measurement. The "Z" height should be as specified in the chart.

h. If the figure is correct, tighten the control arm pivot nuts to 94 ft. lbs. (128 Nm).

i. If the figure is not correct, tighten the pivot bolts to 94 ft. lbs. (128 Nm) and have the front end alignment corrected.

Upper Control Arm

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Tire and wheel assembly
   - Real Time Damping (RTD) link rod from the sensor, if equipped
   - Retaining bolt for the brake hose and the wheel speed sensor brackets
   - Halfshaft
   - Nut at the upper ball joint. Discard the nut
   - Upper control arm from the steering knuckle
   - Upper control arm nuts and the adjustment cams
   - Upper control arm bolts
   - Upper control arm

To install:

3. Install or connect the following:
   - Upper control arm
   - Upper control arm bolts
   - Upper control arm nuts and the adjustment cams. Tighten the nuts to 140 ft. lbs. (190 Nm)
   - Upper control arm to the steering knuckle
   - Halfshaft
   - New nut to the upper ball joint stud. Tighten the nut to 37 ft. lbs. (50 Nm).
   - Retaining bolts for the brake hose and wheel speed sensor brackets. Tighten the bolts to 80 inch lbs. (9 Nm).
   - RTD link rod to the sensor, if equipped
   - Tire and wheel assembly
4. Remove the safety stands.
5. Lower the vehicle. Verify the wheel alignment.

Express and Savana

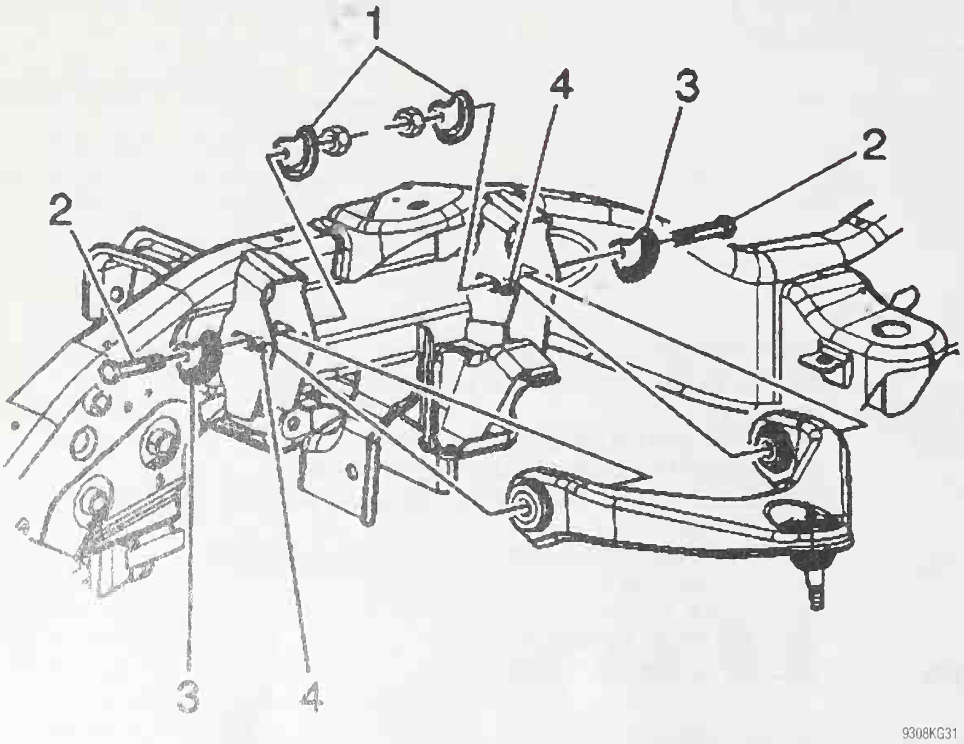
1. Support the lower control arm with a floor jack.
2. Remove or disconnect the following:
   - Wheel
   - Brake hose and wheel speed sensor brackets from the control arm
   - Halfshaft on 4WD only
   - Ball joint from the knuckle
   - Nuts and adjustment cams
   - Control arm to the frame brackets

To install:

3. Install or connect the following:
   - Control arm in position
   - Nuts and adjustment cams and tighten to 129 ft. lbs. (174 Nm)
   - Ball joint to the knuckle. Torque the nut to 37 ft. lbs. (50 Nm).
   - Halfshaft on 4WD only
   - Brake hose and wheel speed sensor brackets from the control arm
   - Wheel

CONTROL ARM BUSHING REPLACEMENT

The control arm bushings are removed and installed using a press.



Upper control arm—Silverado

Lower Control Arm and Bushing

REMOVAL & INSTALLATION

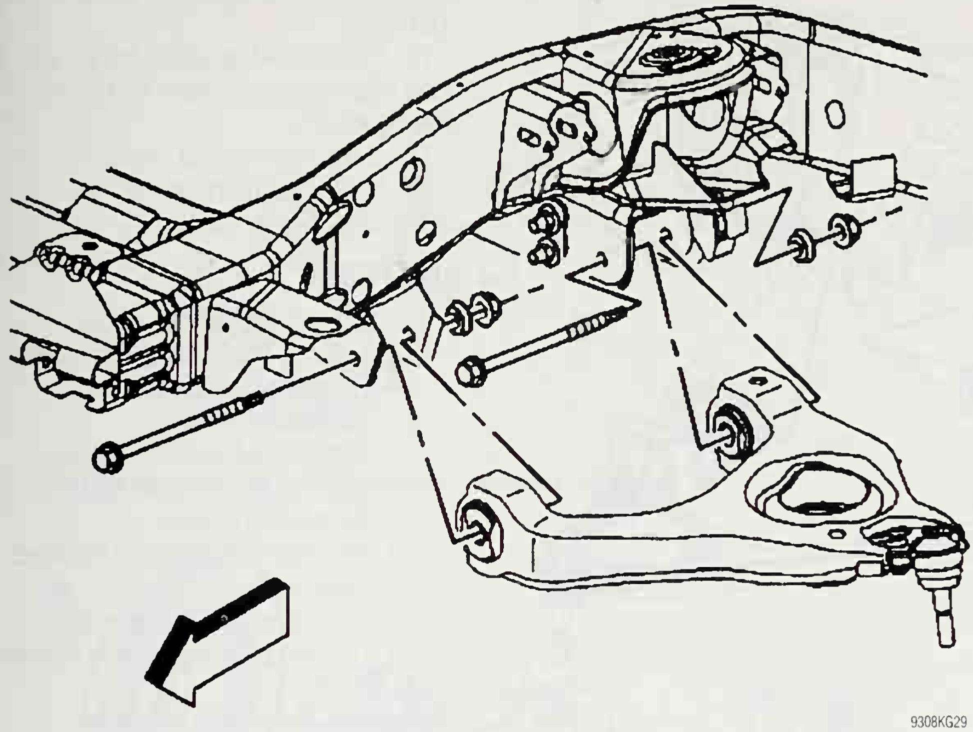
Avalanche, Sierra and Silverado

2WD MODELS

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Tire and wheel assembly
   - Coil spring on vehicles with rack and pinion steering
   - Torsion bar on vehicles with recirculating ball steering
   - Shock absorber
   - Front stabilizer shaft link
   - Lower control arm nuts and the washers
   - Lower control arm bolts
   - Lower ball joint stud nut
   - Lower ball joint stud from the steering knuckle
   - Lower control arm

To install:

3. Install or connect the following:
   - Lower control arm
   - Ball joint stud to the steering knuckle
   - Lower ball joint stud nut. Tighten the lower ball joint stud nut to 74 ft. lbs. (100 Nm)
   - Front coil spring or torsion bar
   - Lower control arm bolt
   - Lower control arm nuts and the washers. Tighten the nuts to 129 ft. lbs. (175 Nm)
   - Front stabilizer shaft link.
   - Shock absorber
   - Tire and wheel assembly
4. Remove the safety stands. Lower the vehicle. Verify the wheel alignment.



2WD lower control arm—15 Series Silverado

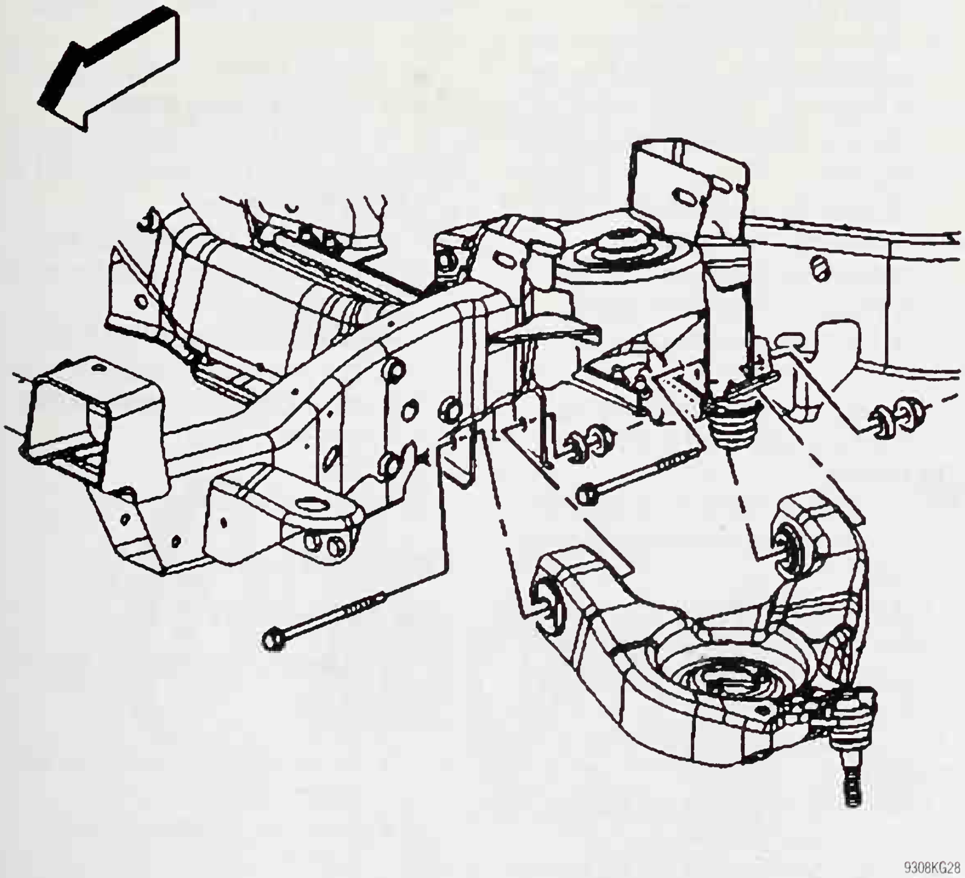
4WD

1. Raise and support the vehicle.
2. Remove or disconnect the following:
   - Tire and wheel assembly
   - Stabilizer shaft links from the lower control arm
   - Shock absorber nut and the bolt
   - Torsion bars
   - Halfshaft
   - Lower ball joint stud nut
   - Lower ball joint stud from the steering knuckle
   - Lower control arm nuts and the washers
   - Lower control arm bolts
   - Lower control arm

To install:

   - Lower control arm
   - Lower control arm bolts
   - Washers with the shoulder facing the arm
   - Nuts and tighten to 129 ft. lbs. (175 Nm)
   - Halfshaft
   - Lower ball joint stud to the steering knuckle. Install the nut to the ball joint stud. Tighten the nut to 74 ft. lbs. (100 Nm).
   - Torsion bars
   - Shock absorber through nut and bolt
   - Stabilizer shaft links to the lower control arm
   - RTD link rod to the sensor (if equipped)
   - Tire and wheel assembly

3. Remove the safety stands. Lower the vehicle. Verify the wheel alignment.



2WD lower control arm—25 Series Silverado

Express and Savana

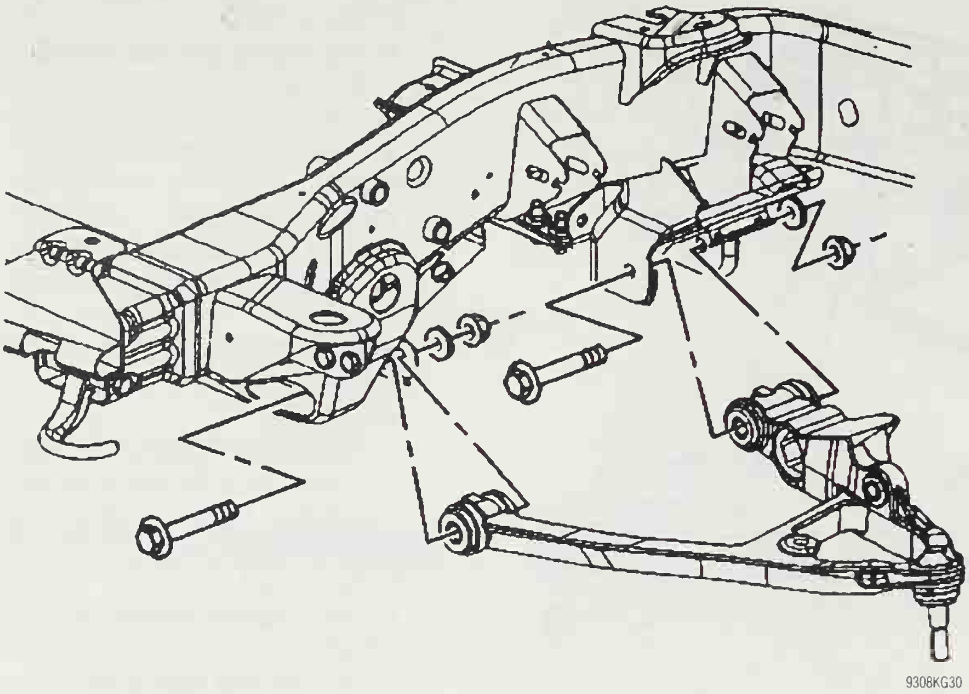
1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the front coil spring on 2WD.
4. On 4WD, remove the torsion bar, stabilizer link, lower shock nut and halfshaft.
5. Remove the lower ball joint retaining nut.
6. Disconnect the lower ball joint from the steering knuckle using ball joint remover and separator.
7. Remove the lower control arm.

To install:

8. Install the lower control arm.
9. On 4WD, tighten the lower control arm mounting nuts and the washers to 107 ft. lbs. (145 Nm).
10. Connect the lower ball joint to the steering knuckle.
11. Install the lower ball joint retaining nut and tighten to 74 ft. lbs. (100 Nm).
12. On 4WD, install the torsion bar, stabilizer link, lower shock nut and halfshaft.
13. Install the front coil spring.
14. Install the tire and wheel.
15. Lower the vehicle.

CONTROL ARM BUSHING REPLACEMENT

➡Control arm bushings are not replaceable. If they are damaged, the control arm will have to be replaced.



4WD lower control arm—15 Series Silverado

Wheel Bearings

ADJUSTMENT

2002 Express and Savana

1. Raise and support the vehicle.
2. Remove the wheel cover, if used.
3. Remove the dust cap from the hub.
4. Remove the cotter pin.
5. Tighten the hub/rotor bearing nut to 12 ft. lbs. (16 Nm), while turning the wheel forward by hand. This will seat the bearings.
6. Adjust the nut to so that it is just loose. Then, back the nut off until the hole in the spindle aligns with a slot in the nut.
7. Install a new cotter pin.
8. Make sure the cotter pin ends do not interfere with the cap.
9. Bend the ends of the cotter pin against the nut.
10. Attach a dial indicator and measure the endplay in the hub/rotor assembly. Proper endplay is 0.001-0.008 in. (0.03-0.20 mm).
11. Install the cap to the hub/rotor.
12. Install the wheel cover, if used.
13. Remove the safety stands.
14. Lower the vehicle.

➡On 2003-06 Express and Savanna and 2002-06 Avalanche, Sierra and Silverado, the wheel bearings on these vehicles are not adjustable.

Wheel Hub, Bearings and Seal

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

2WD—FRONT

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the caliper rotor.
4. Remove the wheel speed sensor and brake hose mounting bracket bolt from the steering knuckle.
5. Remove the wheel hub and bearing mounting bolts.
6. Remove the wheel hub and bearing and splash shield from the vehicle.
7. Remove the O-ring seal from the steering knuckle bore on 25/35 series.
8. Remove the wheel speed sensor mounting bolt.
9. Clean and inspect the O-ring seal. Replace it if it is nicked, cut or ory.

To install:

10. Clean all corrosion or contaminates from the steering knuckle bore and the hub and bearing.
11. Lubricate the steering knuckle bore with wheel bearing grease or the equivalent.
12. Install the O-ring to the steering knuckle on 25/35 series.
13. Install the wheel speed sensor mounting bolt.
14. Install the wheel hub and bearing and splash shield.
15. Install the wheel hub and the bearing mounting bolts and tighten to 133 ft. lbs. (180 Nm).
16. Install the wheel speed sensor and brake hose mounting bracket bolt to the steering knuckle.
17. Install the rotor and caliper.
18. Install the tire and wheel.
19. Lower the vehicle.

4WD FRONT

1. Raise and support the vehicle.
2. Remove or disconnect the following:
    - Tire and wheel assembly
    - Caliper and rotor
    - Wheel speed sensor and brake hose mounting bracket bolt from the steering knuckle
    - Electrical connection for the wheel speed sensor
    - Front drive halfshaft assembly
    - Hub and bearing assembly mounting bolts
    - Hub and bearing assembly
    - O-ring seal from the steering knuckle bore (25 Series)
3. Clean and inspect the O-ring seal (25 Series).

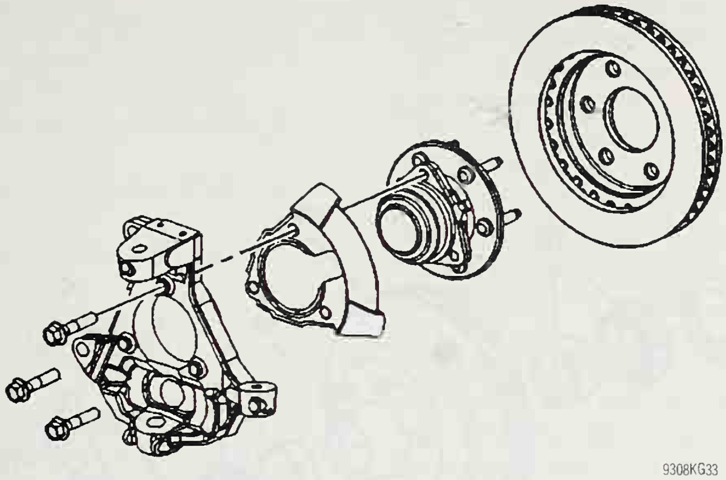
To install:

4. Clean all corrosion or contaminates from the steering knuckle bore and the hub and bearing assembly.
5. Install the O-ring to the steering knuckle (25 Series).
6. Lubricate the steering knuckle bore with wheel bearing grease or the equivalent.
7. Install or connect the following:
    - Hub and bearing assembly
    - Hub and bearing assembly mounting bolts. Tighten the bolts to 133 ft. lbs. (180 Nm).
    - Front drive halfshaft assembly
    - Electrical connection for the wheel speed sensor
    - Wheel speed sensor and brake hose mounting bracket bolt to the steering knuckle. Tighten to 106 inch lbs. (12 Nm).
    - Rotor
    - Tire and wheel assembly.

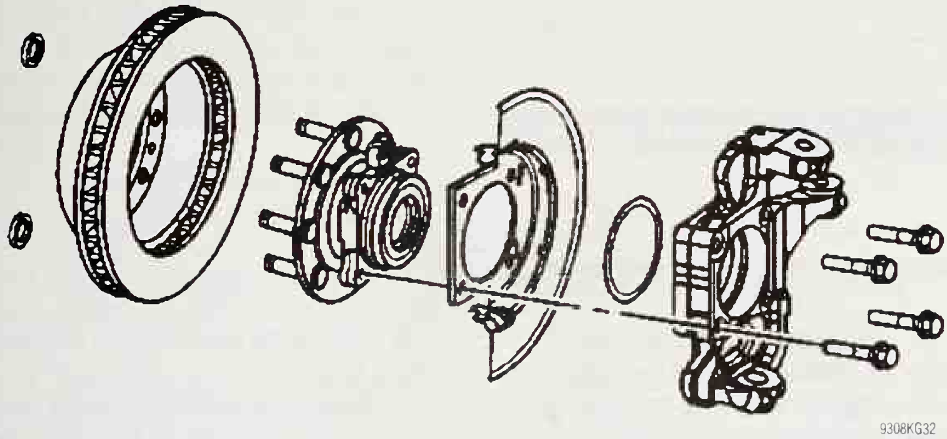
Express and Savana

2002 2WD—FRONT

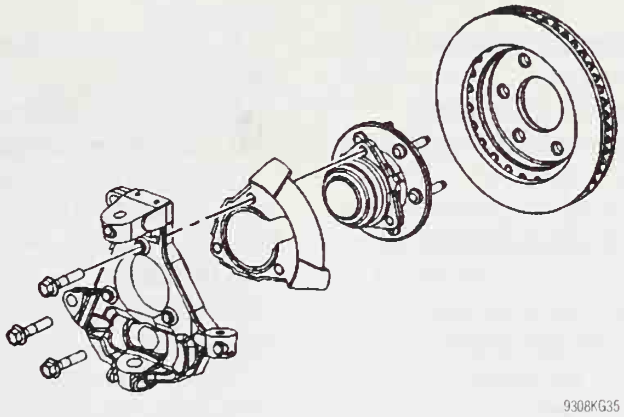
1. Remove or disconnect the following:
    - Wheel
    - Caliper and wire it out of the way
    - Grease cap
    - Cotter pin, spindle nut, and washer
    - Hub.



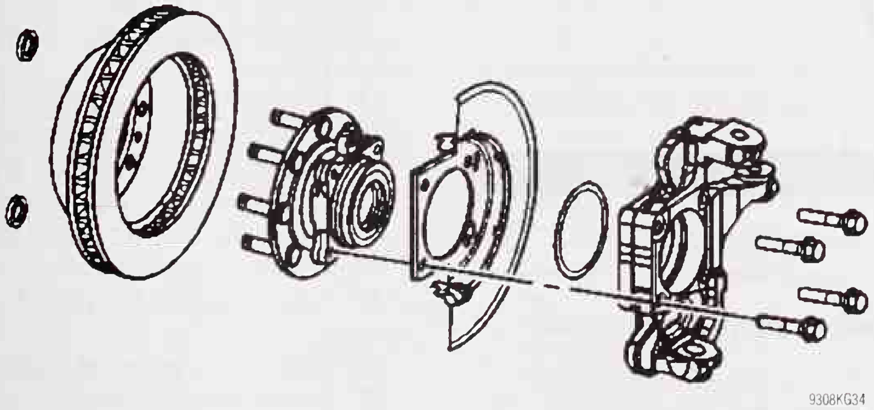
2WD/4WD front hub—15 Series Avalanche, Sierra and Silverado



2WD/4WD front hub —25 Series Avalanche, Sierra and Silverado



4WD front hub—15 Series Silverado



4WD front hub—25 Series Silverado

✲✲ WARNING

Do not drop the wheel bearings.

- Outer roller bearing assembly from the hub

2. The inner bearing assembly will remain in the hub and may be removed after prying out the inner seal. Discard the seal.
3. Clean all parts in a non-flammable solvent and let them air dry. Never spin-dry a bearing with compressed air! Check for excessive wear and damage.
4. If necessary for replacement, remove the bearing races from the hub using a hammer and drift. They are driven out from the inside out.

To install:

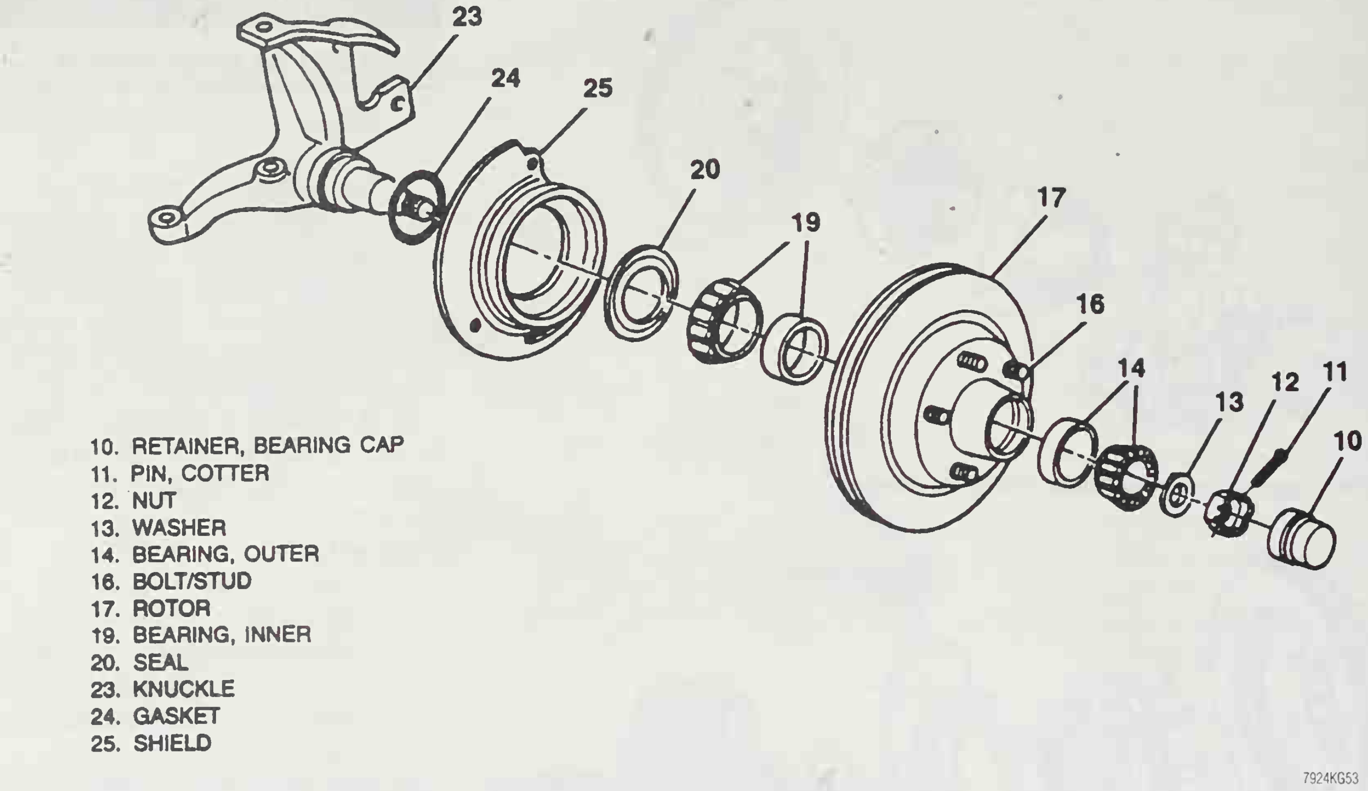
5. Install or connect the following:
   - New bearing races, if required. When installing new races, ensure that they are not cocked and that they are fully seated against the hub shoulder.
6. Pack both wheel bearings using high melting point wheel bearing grease for disc brakes.
   - Inner bearing in the hub and a new inner seal, making sure that the seal flange faces the bearing race.
   - Wheel hub over the spindle
   - Outer bearing into the hub
   - Spindle washer and nut
7. Spin the wheel hub by hand and tighten the nut until it is just snug—12 ft. lbs. (16 Nm). Back off the nut until it is loose, then tighten it finger-tight. Loosen the nut until either hole in the spindle lines up with a slot in the nut and insert a new cotter pin. There should be 0.001–0.008 in. (0.025–0.200mm) end-play. This can be measured with a dial indicator.
8. Replace the dust cap, wheel and tire.

2003–06 2WD—FRONT

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the caliper and rotor.
4. Remove the wheel speed sensor mounting bolt.
5. Remove the wheel speed sensor from the wheel hub and bearing.
6. Remove the wheel hub and bearing mounting bolts.
7. Remove the wheel hub and bearing and splash shield from the steering knuckle.

To install:

8. Clean all corrosion or contaminates from the steering knuckle bore and the hub and bearing.
9. Lubricate the steering knuckle bore with wheel bearing grease or the equivalent.



Exploded view of the front wheel bearing and related components—2002 2-wheel drive models

10. Install the wheel hub and bearing and splash shield to the steering knuckle.
11. Install the wheel hub and bearing mounting bolts and tighten to 133 ft. lbs. (180 Nm).
12. Install the wheel speed sensor to the wheel hub and bearing.
13. Install the wheel speed sensor retaining bolt.
14. Install the rotor and caliper.
15. Install the tire and wheel.
16. Lower the vehicle.

4WD—FRONT

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the caliper and rotor.
4. Remove the front axle hub cap.
5. Remove the halfshaft retaining nut and washer.
6. Using an axle remover, disengage the halfshaft from the hub and bearing.
7. Remove the wheel speed sensor mounting bolt from the wheel hub and bearing.
8. Remove the wheel speed sensor from the wheel hub and bearing.
9. Remove the wheel hub and bearing mounting bolts.
10. Remove the wheel hub and bearing and splash shield from the steering knuckle.

To install:

11. Clean all corrosion or contaminates from the steering knuckle bore and the hub and bearing.
12. Lubricate the steering knuckle bore with wheel bearing grease or the equivalent.
13. Install the wheel hub and bearing and splash shield to the steering.
14. Install the wheel hub and bearing mounting bolts and tighten to 133 ft. lbs. (180 Nm).
15. Install the wheel speed sensor to the wheel hub and bearing.
16. Install the wheel speed sensor mounting bolt to the wheel hub and bearing.
17. Install the wheel driveshaft retaining nut and washer and tighten to 155 ft. lbs. (210 Nm).
18. Install the front axle hub cap.
19. Install the rotor and caliper.
20. Install the tire and wheel.
21. Lower the vehicle .
22. Check and adjust the front end alignment and road test the vehicle.

REAR

See the Rear Axle Shaft, Bearing and Seal procedure for bearing replacement

Stabilizer Bar

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the stabilizer shaft nut from the link bolt.
4. Remove the stabilizer shaft link bolt.
5. Remove the stabilizer shaft link insulators and spacers.
6. Remove the oil pan skid plate, if equipped.
7. Remove the stabilizer shaft insulator bracket bolts.
8. Remove the stabilizer shaft bracket.
9. Remove the stabilizer shaft.
10. Remove the stabilizer shaft insulators.
11. Inspect all of the parts for wear and damage.

To install:

12. Install the insulators to the stabilizer shaft.
13. Install the stabilizer shaft.
14. Install the brackets over the insulators and the stabilizer shaft.
15. Install insulator bracket bolts and tighten to 37 ft. lbs. (50 Nm).
16. Install the stabilizer shaft link insulators and spacers.
17. Apply Loctite® on the threads of the stabilizer link bolts then install the bolts.
18. Install the stabilizer shaft nut to the link bolt and tighten to 89 inch lbs. (10 Nm), and continue to tighten the nut until 2-4 threads protrude above the nut.
19. Install the oil pan skid plate, if equipped.
20. Install the tire and wheel assembly.
21. Remove the safety stands
22. Lower the vehicle.

Express and Savana

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the stabilizer shaft nut from the link bolt.
4. Remove the stabilizer shaft link bolt.
5. Remove the stabilizer shaft link insulators and spacers.
6. Remove the stabilizer shaft insulator clamps mounting bolts (15 and 25 series).
7. Remove the stabilizer shaft clamps (1500 and 2500 series w/7300 GVW).
8. Remove the stabilizer shaft (1500 and 2500 series w/7300 GVW).
9. Remove the stabilizer shaft insulators (1500 and 2500 series w/7300 GVW).
10. Remove the stabilizer shaft insulator clamps mounting nuts and/or studs (2500 series w/8500 and 8600 GVW and 3500 series).
11. Remove the stabilizer shaft clamps (2500 series w/8500 and 8600 GVW and 3500 series).
12. Remove the stabilizer shaft (2500 series w/8500 and 8600 GVW and 3500 series).
13. Remove the stabilizer shaft insulators (2500 series w/8500 and 8600 GVW and 3500 series).
14. Inspect all of the parts for wear and damage.

To install:

15. Install the stabilizer shaft insulator clamp studs, if removed (2500 series w/8500 and 8600 GVW and 3500 series) and tighten to 18 ft. lbs. (25 Nm).
16. Place the stabilizer shaft insulators on the stabilizer shaft with the slits facing toward the front of the vehicle.
17. Install the stabilizer shaft insulators to the stabilizer shaft (2500 series w/8500 and 8600 GVW and 3500 series).
18. Install the stabilizer shaft (2500 series w/8500 and 8600 GVW and 3500 series).
19. Install the stabilizer shaft clamps over the insulators and the stabilizer shaft (2) (2500 series w/8500 and 8600 GVW and 3500 series).
20. Install stabilizer shaft insulator clamps mounting nuts (2500 series w/8500 and 8600 GVW and 3500 series) and tighten the nuts to 34 ft. lbs. (46 Nm).
21. Install the stabilizer shaft insulators (1500 and 2500 series w/7300 GVW).
22. Install the stabilizer shaft (1500 and 2500 series w/7300 GVW).
23. Install the stabilizer shaft clamps (1500 and 2500 series w/7300 GVW).
24. Install the stabilizer shaft insulator clamps mounting bolts (1500 and 2500 series w/7300 GVW) and tighten to 18 ft. lbs. (25 Nm).
25.
26. Apply Loctite® on the threads of the stabilizer link bolts then install the bolts.
27. Install the stabilizer shaft nut to the link bolt and tighten to 97 inch lbs. (11 Nm).
28. Install the stabilizer shaft link insulators and spacers.
29. Install the tire and wheel.
30. Lower the vehicle.

Steering Knuckle

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the wheel hub and bear-ing.
4. Support the lower control arm with a suitable jack.
5. Disconnect the outer tie rod from the knuckle.
6. Remove the brake hose bracket retaining bolt from the knuckle.
7. Remove the retaining nut and separate the upper and lower ball joints from the steering knuckle using a ball joint remover and adapters.
8. Remove the steering knuckle.

To install:

9. Clean all grease and contaminants from the tapered section and the threads of the upper ball joint, the lower ball joint, and the tie rod end.
10. Clean and inspect the taper holes and the mounting surfaces of the steering knuckle. If any of the tapered holes are elongated, out of round, or damaged, the replace the steering knuckle.
11. Install the steering knuckle.
12. Connect the lower ball joint to the steering knuckle and install the retaining nut and tighten to 74 ft. lbs. (100 Nm).
13. Connect the upper ball joint to the steering knuckle and install the retaining nut and tighten to 37 ft. lbs. (50 Nm).
14. Install the brake hose bracket retaining bolt to the knuckle.
15. Connect the outer tie rod to the steering knuckle.
16. Install the wheel hub and bearing.
17. Install the tire and wheel.
18. Remove the safety stands.
19. Lower the vehicle.

Express and Savana

1. Raise and support the vehicle.
2. Remove the tire and wheel.
3. Remove the wheel hub and bearing.
4. Remove the outer tie rod-to-steering knuckle retaining nut.
5. Disconnect the outer tie rod from the steering knuckle.
6. Remove the brake hose bracket retaining bolt from the steering knuckle.
7. Support the lower control arm with a suitable jack.
8. Remove the upper and lower ball joint retaining nuts.
9. Separate the upper and lower ball joints from the steering knuckle using a ball joint remover and adapters.
10. Remove the steering knuckle.

To install:

11. Clean all grease and contaminants from the tapered section and the threads of the upper ball joint, the lower ball joint, and the tie rod end.
12. Clean and inspect the taper holes and the mounting surfaces of the steering knuckle. If any of the tapered holes are elongated, out of round, or damaged, the replace the steering knuckle.
13. Install the steering knuckle.
14. Connect the lower ball joint to the steering knuckle and install the retaining nut and tighten to 74 ft. lbs. (100 Nm).
15. Connect the upper ball joint to the steering knuckle and install the retaining nut and tighten to 37 ft. lbs. (50 Nm).
16. Install the brake hose bracket retaining bolt to the knuckle.
17. Connect the outer tie rod to the steering knuckle.
18. Install the outer tie rod to the steering knuckle retaining nut and tighten to 47 ft. lbs. (63 Nm).
19. Remove the safety stand.
20. Install the wheel hub and bearing.
21. Install the tire and wheel.

22. Lower the vehicle.

Brake Caliper

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

FRONT

1. Remove or disconnect the following:
   - ⅔ of the brake fluid from the master cylinder
   - Tire and wheel assembly
2. Using a C-clamp or the equivalent, compress the caliper piston until the caliper piston bottoms in the bore.
   - Brake hose at caliper by removing the inlet fitting bolt. Plug the line.
   - Caliper mounting bolts
   - Caliper
3. Inspect the caliper assembly.

To install:

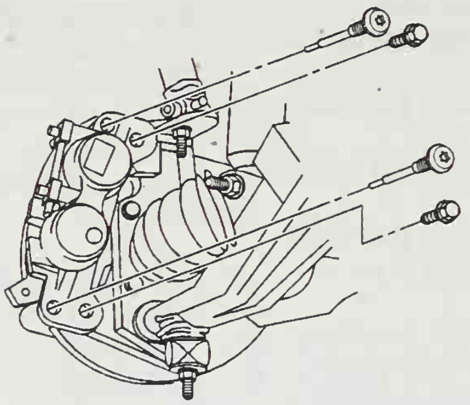
4. Install or connect the following:
   - Caliper
   - Caliper mounting bolts. Tighten the caliper guide pin bolts to 74 ft. lbs. (100 Nm) on 15 series or 80 ft. lbs. (108 Nm) on 25/35 series..
   - Brake hose at caliper by installing the inlet fitting bolt. Tighten the inlet fitting bolt to 33 ft. lbs. (45 Nm).
5. Bleed the brakes.
   - Tire and wheel assembly

REAR

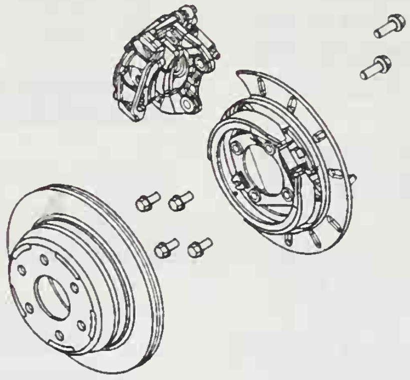
1. Remove or disconnect the following:
   - ⅔ of the brake fluid from the master cylinder
   - Tire and wheel assembly
2. Using a C-clamp or the equivalent, compress the caliper piston until the caliper piston bottoms in the bore.
   - Brake hose at caliper by removing the inlet fitting bolt. Plug the line.
   - Caliper mounting bolts
   - Caliper
3. Inspect the caliper assembly.

To install:

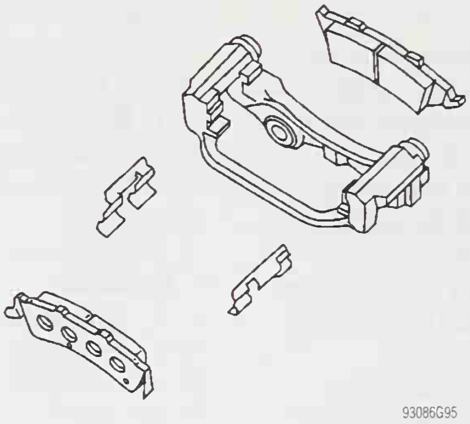
4. Install or connect the following:
   - Caliper
5. Perform the following procedure before installing the caliper guide pin bolts (15 Series only).
   a. Remove all traces of the original adhesive patch.



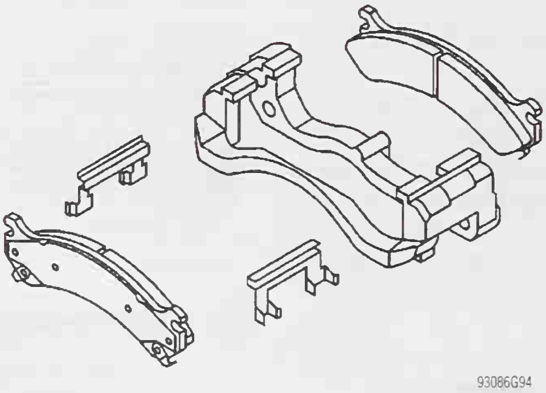
Front caliper removal—Avalanche, Sierra & Silverado



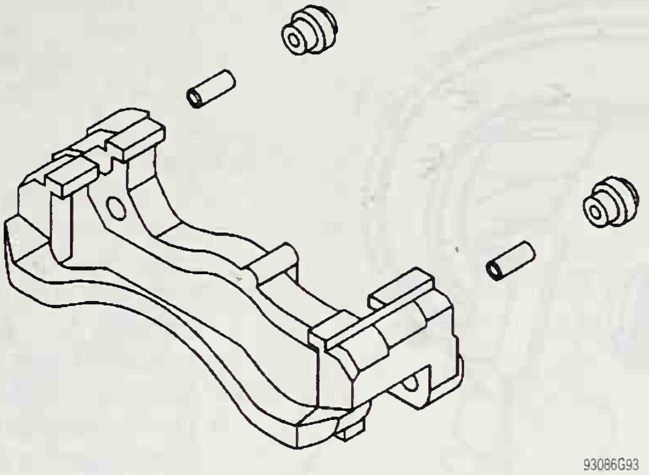
Rear caliper removal—15 Series Silverado/Sierra



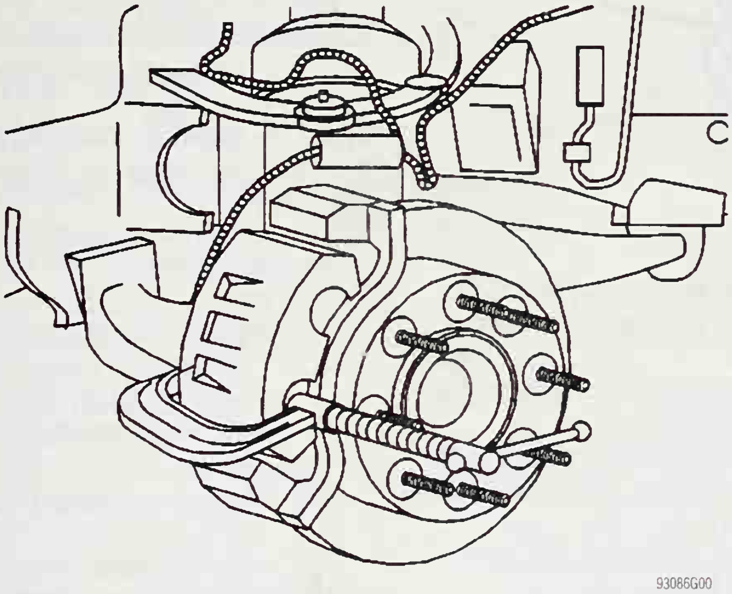
Rear pad removal—15 Series Silverado/Sierra



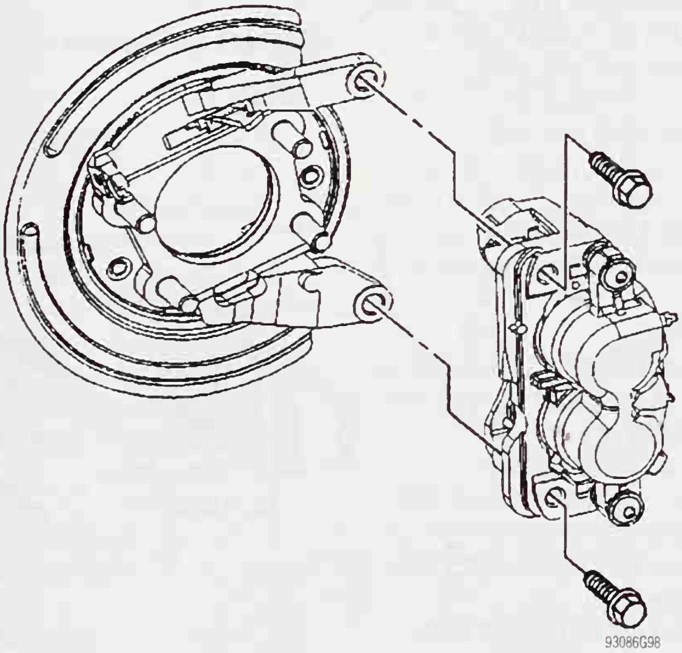
Rear pad removal—25 Series Silverado



Sleeve and bushing removal—15 Series Silverado/Sierra



Compressing the rear caliper piston—15 Series Silverado/Sierra



Rear caliper removal—25 Series Silverado

b. Clean the threads of the bolt with brake parts cleaner or the equivalent and allow to dry.

c. Apply Red Loctite® no. 272 to the threads of the bolt.

6. Install or connect the following:
   - Caliper mounting bolts. Tighten the caliper guide pin bolts to 31 ft. lbs. (42 Nm) on the 15 series; 80 ft. lbs. (108 Nm) on the 25 series.
   - Brake hose at the caliper by installing the inlet fitting bolt. Tighten the bolt to 33 ft. lbs. (45 Nm).
7. Bleed the brakes.
   - Tire and wheel assembly
8. Refill the brake master cylinder to the proper level with fresh brake fluid.

Express and Savana

FRONT AND REAR

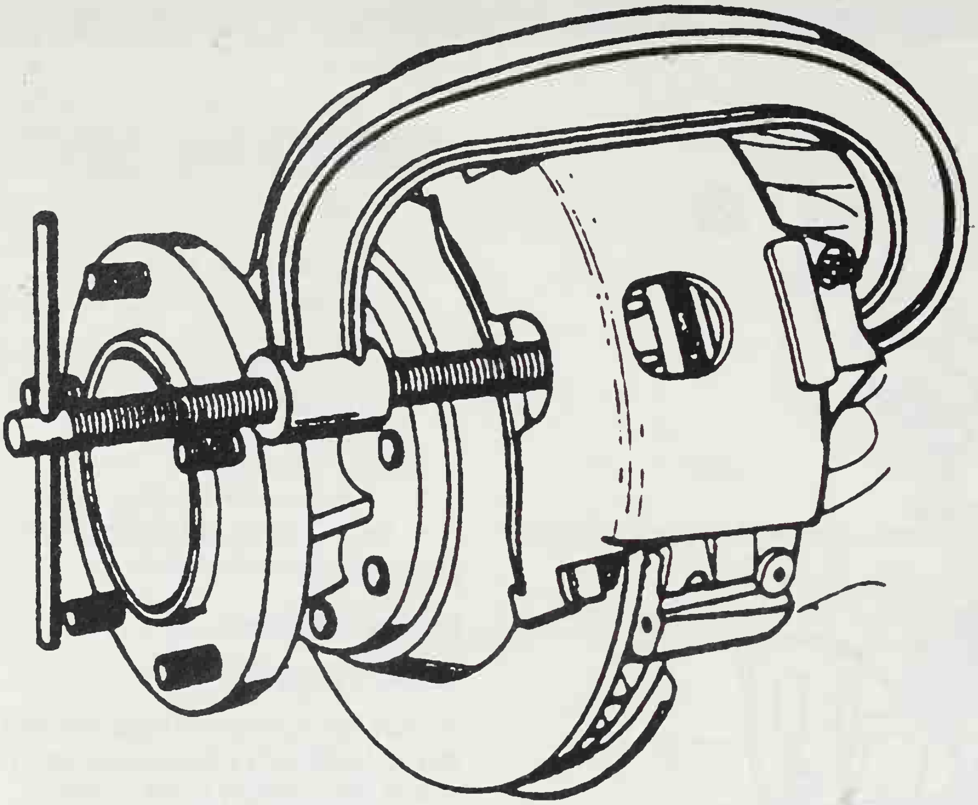
➡There are 2 caliper designs and they can be identified by the method used to secure the assembly to the spindle bracket. The Delco caliper is secured by a bolt and sleeve combination. The Bendix caliper assembly is secured by a slider, spring and bolt.

1. Remove or disconnect the following:
   - ⅔ of the brake fluid from the master cylinder
   - Tire and wheel assembly
2. Using a C-clamp or the equivalent, compress the caliper piston until the caliper piston bottoms in the bore.
   - Brake hose at caliper by removing the inlet fitting bolt. Plug the line.
   - Bolt and sleeve or bolt and slider assemblies that hold the caliper and then lift the caliper off the rotor
3. Inspect the caliper assembly.

To install:

4. Install or connect the following:
   - Caliper onto the knuckle/rotor assembly and secure the assembly with the mounting bolts or sliders.

   Tighten the front bolts to 80 ft. lbs. (108 Nm). Tighten the rear bolts to 31 ft. lbs. (30 Nm) on 15 series and 80 ft. lbs. (108 Nm) on 25/35 series.
   - Brake line to the caliper
5. Bleed the brakes.
6. Pump the brake pedal and verify there is minimal brake pedal travel.
7. Check the brake fluid level. Install the tire and wheel assembly.



Compressing the caliper piston—Express & Savana

Disc Brake Pads

REMOVAL & INSTALLATION

Avalanche, Sierra and Silverado

FRONT

1. Remove ⅔ of the brake fluid from the master cylinder.
2. Remove or disconnect the following:
   - Wheel
   - Caliper. Suspend the caliper from the frame with mechanic's wire. Do not allow the caliper to hang from the brake hose.
   - Caliper mounting bracket bolts
   - Caliper mounting bracket from the steering knuckle assembly
   - Brake pads from the caliper mounting bracket
   - Clips from the inside ends of the caliper mounting bracket and discard

To install:

3. Install or connect the following:
   - Clips to the inside ends of the caliper mounting bracket
   - Brake pads to the caliper mounting bracket
   - Inner pad (1 wear indicator)
   - Outer pad (2 wear indicators)
   - Caliper mounting bracket to the steering knuckle assembly
4. Perform the following procedure before installing the caliper mounting bracket bolts:
   a. Remove all traces of the original adhesive patch.
   b. Clean the threads of the bolt with brake parts cleaner or the equivalent and allow to dry.
   c. Apply red Loctite® 272 to the threads of the bolt.
5. Install or connect the following:
   - Caliper mounting bracket bolts to the steering knuckle. Tighten the caliper guide pin bolts to 74 ft. lbs. (100 Nm) on 15 series or 80 ft. lbs. (108 Nm) on 25/35 series.
   - Caliper
   - Tire and wheel assembly
6. Refill the master cylinder to the proper level with fresh brake fluid. Pump the brake pedal slowly and firmly in order to seat the brake pads. Burnish the brakes as needed.

REAR

1. Remove or disconnect the following:
   - ⅔ of the brake fluid from the master cylinder
   - Tire and wheel assembly
   - Caliper. Suspend the caliper from the frame with mechanic's wire. Do not allow the caliper to hang from the brake hose.
   - Caliper mounting bracket bolts from the backing plate
   - Brake pads from the caliper mounting bracket
   - Clips from the inside ends of the caliper mounting bracket and discard

To install:

2. Install or connect the following:
   - Clips to the inside ends of the caliper mounting bracket
   - Brake pads to the caliper mounting bracket
   - Inner pad (1 wear indicator)
   - Outer pad (2 wear indicators)
   - Clips to the inside ends of the caliper mounting bracket
   - Caliper mounting bracket to the backing plate assembly (15 series).
3. Install the caliper mounting bracket to the backing plate assembly (25 series). Perform the following procedure before installing the caliper mounting bracket bolts.
   a. Remove all traces of the original adhesive patch.
   b. Clean the threads of the bolt with brake parts cleaner or the equivalent and allow to dry.
   c. Apply red Loctite® 272 to the threads of the bolt.
4. Install or connect the following:
   - Caliper mounting bracket bolts to the steering knuckle. Tighten to 148 ft. lbs. (200 Nm) on the 15 series; 122 ft. lbs. (165 Nm) on the 25 series.
   - Caliper and tighten the bolts to 80 ft. lbs. (108 Nm).
   - Tire and wheel assembly
5. Refill the master cylinder to the proper level with fresh brake fluid. Pump the brake pedal slowly and firmly in order to seat the brake pads. Burnish the brakes as needed.

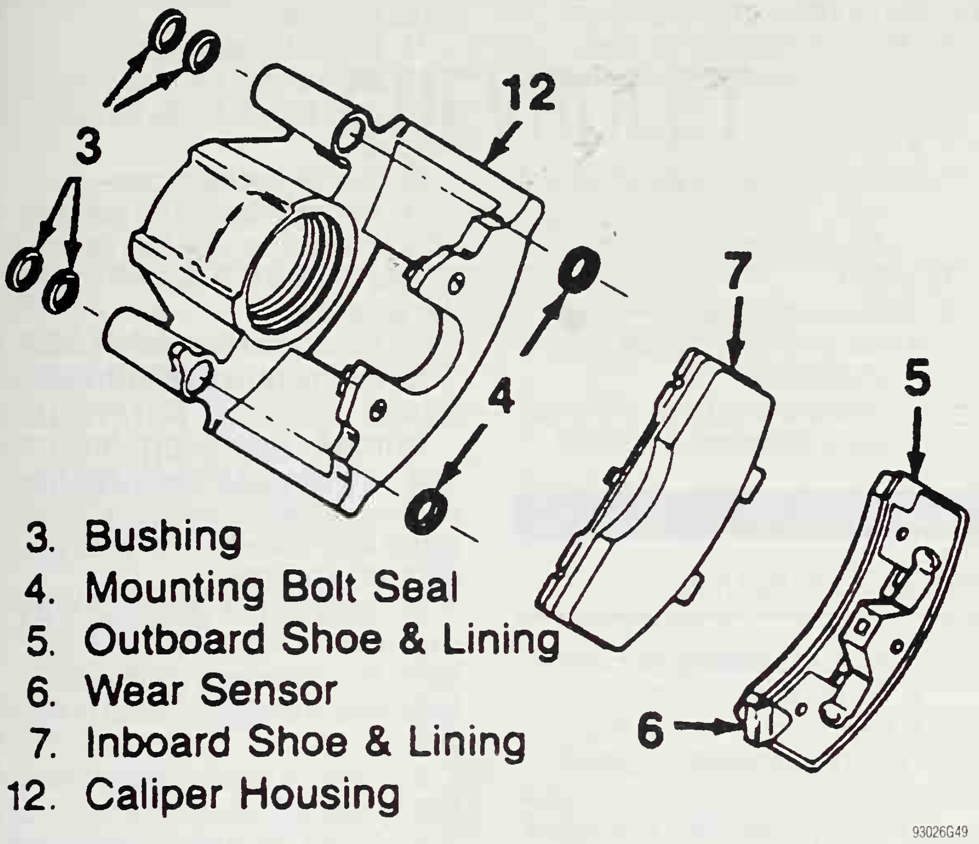
Express and Savana

DELCO TYPE

1. Remove or disconnect the following:
   - ⅔ of the brake fluid from the master cylinder
   - Tire and wheel assembly
2. Compress the brake piston back into its bore using a C-clamp.
   - 2 bolts holding the caliper and then lift the caliper off the disc
   - Inboard and outboard pads
   - Pad support spring from the piston, if equipped

To install:

3. Thoroughly inspect, clean and lubricate all caliper slide points, bolts and hardware.
4. Install or connect the following:
   - Retainer spring on the inner pad



Replacing the disc brake pads—Delco type

and insert the assembly into the center cavity of the piston

5. Push down on the inner pad until it lays flat against the caliper. It is important to push the piston all the way into the caliper if new linings are installed or the caliper will not fit over the rotor.

- Outboard pad with the ears of the pad over the caliper ears and the tab at the bottom engaged in the caliper cutout
- Caliper over the brake disc and align the holes in the caliper with those of the mounting bracket
- Mounting bracket bolts through the sleeves in the inboard caliper ears and through the mounting bracket, making sure the ends of the bolts pass under the retaining ears on the inboard pad
- Mounting bolts to 80 ft. lbs. (108 Nm). After both calipers are mounted pump the brake pedal to seat the pad against the rotor. Use a pair of locking pliers to bend over the upper ears of the outer pad so it isn't loose.
- Wheels

6. Add fluid to the master cylinder reservoirs so they are ¼ in. (6.35mm) from the top.

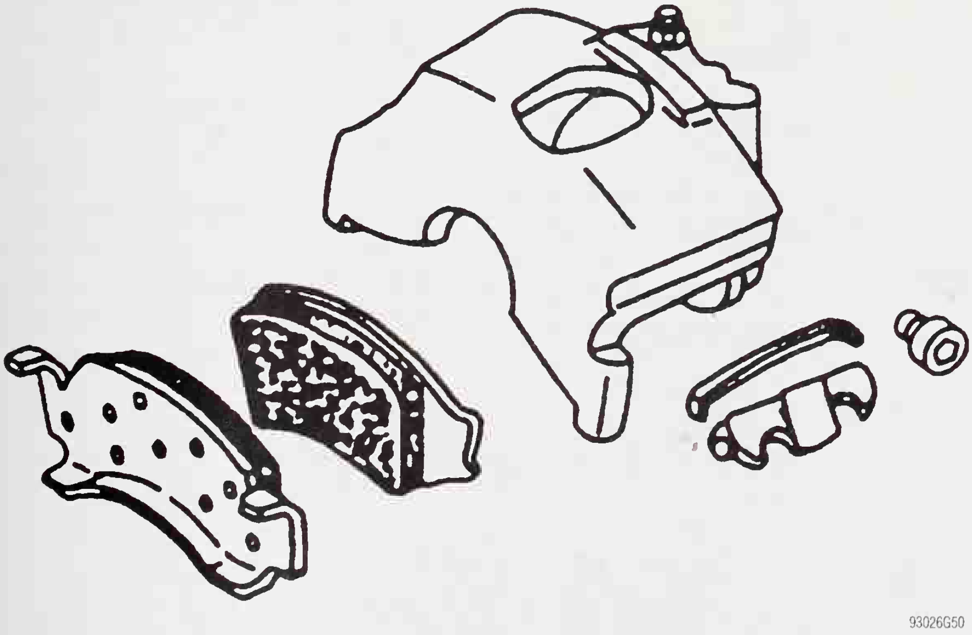
7. Test the brake pedal by pumping it to obtain a hard pedal. Check the fluid level again and add fluid as necessary. Do not move the vehicle until a pedal is obtained.

BENDIX TYPE

1. Remove or disconnect the following:
    - ⅔ of the brake fluid from the master cylinder
    - Tire and wheel assembly
2. Compress the brake piston back into its bore using a C-clamp.
    - Bolt at the caliper slider. Use a brass drift pin to remove the slider and spring.
    - Caliper up and forward from the bottom and lift it off the caliper support. Tie the caliper out of the way with a piece of wire. Be careful not to damage the brake line.
    - Inner shoe from the caliper support. Discard the inner shoe clip.
    - Outer shoe from the caliper

To install:

3. Thoroughly clean, inspect and lubricate the caliper, slider and spring with silicone.
4. Install or connect the following:
    - New inboard shoe clip on the shoe
    - Lower end of the inboard shoe into the groove provided in the support. Slide the upper end of the shoe into position. Be sure the clip remains in position.
    - Outboard shoe in the caliper, with the ears at the top of the shoe over the caliper ears and the tab at the bottom of the shoe engaged in the caliper cutout. If assembly is difficult, a C-clamp may be used. Be careful not to damage the lining.
    - Caliper over the brake disc, top edge first. Rotate the caliper downward onto the support.
    - Spring over the caliper support key, install the assembly between the support and lower caliper groove.



Replacing the disc brake pads—Bendix type

Tap into place until the key retaining screw can be installed.

- Screw and torque to 15 ft. lbs. (20 Nm). The boss must fit fully into the circular cutout in the key.

5. Install the wheel and add brake fluid as necessary.

Brake Drums

REMOVAL & INSTALLATION

With Semi-Floating Axles

1. Raise and support the vehicle safely.
2. Mark the relationship of the wheel to the hub and remove the wheel.
3. Mark the relationship of the drum to the hub and pull the drum from the brake assembly. If the brake drums have been scored from worn linings, the brake adjuster must be backed off so the brake shoes will retract from the drum. The adjuster can be backed off by inserting a brake adjusting tool through the access hole provided. In some cases the access hole is provided in the brake drum. A metal cover plate is over the hole. This may be removed by using a hammer and chisel.

To install:

4. Align the mark on the drum to mark on hub and install drum
5. Align the mark on the wheel to mark on drum and install wheel
6. Adjust brake lining as needed. Pump brakes

With Full Floating Axles

To remove the drums from full floating rear axles, the axle shaft will have to be removed. Full-floating rear axles can be identified by a bearing housing that protrudes through the center of the wheel.

1. Remove or disconnect the following:
   - Wheel
   - Axle shaft
   - Retaining ring, key and adjusting nut
   - Hub and drum

To install:

2. Install or connect the following:
   - Hub and drum to the tube
   - Adjusting nut
   - Key and retaining ring
   - Axle shaft and wheel

Brake Shoes

REMOVAL & INSTALLATION

1. Remove or disconnect the following:
   - Tire and wheel assembly
   - Brake drums
2. Using denatured alcohol, clean the rear brake shoes.
3. Adjust the brake shoes to the lowest position. This will reduce the tension on the retractor spring.
4. Remove the adjuster spring.
5. Remove the brake adjuster lever.
6. Remove the adjuster assembly.
7. Using a pair of channel locks, remove the retractor spring from the secondary brake shoe.
8. Remove the secondary brake shoe from the backing plate.
9. Using a pair of channel locks, remove the retractor spring from the primary brake shoe.
10. Remove the primary brake shoe from the backing plate.
11. Remove the return spring.
12. Using a small flat-blade screwdriver, press the lock tab for the park brake cable.
13. Hold the lock tab in place.
14. Pushing forward on the park brake cable will unlock the cable from the retainer allowing the cable to be removed from the park brake lever.
15. Push the park brake cable forward.
16. Remove the park brake cable from the lever.

To install:

17. Apply a small amount of high temperature silicone grease or equivalent to the contact areas between the rear brake shoes and the backing plate.
18. Install the park brake cable in the lever. A snap or clip should be felt or heard. This will indicate that the park brake cable is properly in seated in the lever.
19. Install the retractor spring on the backing plate.
20. Using a pair of channel locks, install the retractor spring in the primary brake shoe.
21. Install the secondary brake shoe on the backing plate.
22. Using channel locks, install the retractor spring in the secondary brake shoe.
23. Install the adjuster spring.
24. Install the brake adjuster lever.
25. Install the adjuster assembly.
26. Adjust the rear brake shoes.
27. Install the rear brake drum.